COLUMBUS SAFE ROUTES TO SCHOOL
DISTRICT-WIDE TRAVEL PLAN

HEALTH IMPACT ASSESSMENT

FULL REPORT

THE CITY OF COLUMBUS
MICHAEL B. COLEMAN, MAYOR
COLUMBUS PUBLIC HEALTH

HUMAN IMPACT PARTNERS

COLUMBUS SAFE ROUTES TO SCHOOL
DISTRICT-WIDE TRAVEL PLAN

HEALTH IMPACT ASSESSMENT

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EXECUTIVE SUMMARY

SAFE ROUTES TO SCHOOL

Safe Routes to School is an initiative which recognizes that the levels of childhood obesity and the levels of active transportation to school are integrally linked – if the levels of active transportation to school can be raised, the levels of childhood obesity can be correspondingly lowered. If this perception is correct, Safe Routes to School can have the positive effect of lowering the levels of body mass index for over 36,000 Kindergarten – 8th grade Columbus City School students, over 13,000 of who are at risk for obesity.

THE LARGE DISTRICT SCHOOL TRAVEL PLAN

During the 2013-2014 school year Columbus Public Health in partnership with Columbus City Schools and with the support of the Ohio Department of Transportation set out to create one of the first Large District School Travel Plans, entailing 24 or more schools, in the United States. Funding was allotted to perform a Health Impact Assessment on the plan to ensure that current social and health disparity gaps in the Columbus City School District are lessened by the plan instead of risking the inadvertent widening of those gaps. This was done by using socio-demographic data along with a selection of health indicators to decide upon 15 Focus Schools out of the 94 Columbus City Schools with Kindergarten – 8th grade students. An extensive literature review was also conducted along with collecting a variety of first hand data. This data was compiled and sorted into 3 main areas of study: physical activity, traffic safety and crime. Predictions and recommendations were made based on the data and research in order to better inform the travel plan steering committee on how to ensure that health and social equity is taken into consideration while creating the countermeasures, a set of solutions, made by the plan.

For the full executive summary, www.publichealth.columbus.gov

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INTRODUCTION

BACKGROUND ON SAFE ROUTES TO SCHOOL DISTRICT-WIDE TRAVEL PLAN

A *School Travel Plan (STP)* outlines a school district's intentions for enabling kindergarten – 8th grade *(K-8)* students to engage in active transportation (walking, bicycling, or rolling) to and from school. School Travel Plans are created through a team-based approach that involves key community stakeholders to identify barriers to active transportation and creating recommendations, termed countermeasures, to address them. This process creates a vision for how to identify safe and direct routes to school that encourage students to walk and bike to school. School Travel Plans are also required for funding requests through the *Ohio Department of Transportation (ODOT) Safe Routes to School (SRTS)* program.

Nationally, SRTS has been encouraging the creation of School Travel Plans for individual schools or a few schools for over ten years, but there are very few cities that have created travel plans for the entire school district at once. In 2013, *Columbus Public Health (CPH)* was awarded a Safe Routes to Schools grant from the Ohio Department of Transportation to create one of the first *Large District School Travel Plans (LDSTP)* in the nation for *Columbus City Schools (CCS)*. Once the LDSTP is in place, CCS and City of Columbus can apply for federal/state money to implement activities and projects in the plan (up to $60,000 for non- infrastructure and up to $400,000 for infrastructure in 2015).

Safe Routes to Schools has been widely implemented partially due to a national childhood obesity epidemic. In the United States, 49% of children are either overweight or obese.[1] A decrease in walking and biking to school could be a contributing factor to the obesity epidemic; in 1969, 48% of children walked or biked to school in the United States; in 2009 only 13% of children do.[2] Columbus, Ohio is not an outlier. Over one-third of all Columbus City School third graders are overweight (35% in 2013-2014 school year), 69% received free or reduced lunch in the 2013-2014 school year (all students receive free breakfast and lunch now), 10% had limited English proficiency, 74% were not Caucasian. Over the last 4 school years, in CCS, the number of students at risk for obesity from when a child enters kindergarten until they reach 7th grade has increased by almost 60%.[3]

The Safe Routes to School Large District School Travel Plan will affect over 36,000 Columbus City School District students, approximately 14,400 of which use public school bus transportation daily to travel across 220 square miles of the City of Columbus in order to access 92 school buildings that house K-8 students.

The LDSTP consists of infrastructure and non-infrastructure components, which are further defined by five aspects. These aspects categorize the countermeasures commonly referred to as the 5 E's:

1. **Engineering** (Infrastructure): considers where the built environment can be improved to better accommodate walking and biking. Examples are: crosswalks, sidewalks, separated bicycle lanes, and other infrastructure treatments.
2. **Education** (Non-Infrastructure): programming that educates K-8 students on how to

safely interact with the built environment when walking and biking. Examples include: bicycle rodeos, in-class safety lessons, and other educational activities.

3. **Encouragement** (Non-Infrastructure): initiatives and activities facilitate walking and biking by K-8 students. This includes: Walking School Busses, Bicycle Trains, Mileage Clubs, and Walk and Bike to School Days.
4. **Enforcement** (Non-Infrastructure): efforts by local police and the community that focus on decreasing crashes and increasing safety from crime in the neighborhoods that surround K-8 schools. Some examples are: speed wagons, increased traffic infraction ticketing, general police presence, and neighborhood grassroots organizations.
5. **Evaluation** (Non-Infrastructure): is a post-SRTS programming and infrastructure review as to how SRTS infrastructure and non-infrastructure has impacted walking and biking to school.

Furthermore there is a 6th E that drives the LDSTP process.

6. **Equity** (Non-Infrastructure and Infrastructure): This equity aspect is a major driver in the emergence of LDSTPs in Ohio as the majority of these large urban school districts are made up of underprivileged/disadvantaged student populations that live in largely dense urban environments which by design lend themselves to shorter travel distances that can facilitate the use of active transportation travel.

The Columbus City School Large District School Travel Plan is one of the first LDSTPs in the nation and the first LDSTP to utilize a Health Impact Assessment (HIA) process to guide the formation of the plan. The result of the LDSTP is the prioritization of key corridors for engineering/infrastructure projects, and to a small extent some minimal funding for encouragement, education, and enforcement countermeasures. The corridors are selected based on the geographical density of students and the existing infrastructure network that can be easily connected in those corridors.

DECISION-MAKING PROCESS & SRTS STEERING COMMITTEE

The decision-making process includes decision-making points at regular SRTS Steering Committee Meetings, approval of the plan by ODOT, endorsements from Columbus City Schools, The City of Columbus, and the Mid-Ohio Regional Planning Commission (MORPC), and adoption of the plan by the Columbus City School Board. The decision-makers are the Columbus City Schools Safe Routes to School Steering Committee, the Columbus City School Board, the Ohio Department of Transportation (ODOT), the City of Columbus Department of Public Service, the City of Columbus Mayor's Office, the Mid-Ohio Regional Planning Commission, and the Columbus Division of Police.

The Safe Routes to School Steering Committee (also serving as the HIA Advisory Committee) consisted of representatives from the following organizations:

- Mid-Ohio Regional Planning Commission *(MORPC)*
- City of Columbus Department of Public Service
- City of Columbus Mayor's Office
- Ohio Department of Transportation *(ODOT)*
- City of Columbus Department of Public Safety
- Columbus City Schools (Transportation and Wellness Departments) *(CCS)*
- Safe Routes to School National Partnership

- Ohio Department of Health *(ODH)*
- TranSystems
- Murphy Epson

As a result of this HIA, the core HIA team created a list of recommendations for the LDSTP that were taken into consideration during the formulation and prioritization of the countermeasures used to address the issues discovered by the LDSTP process.

HIA METHODOLOGY

An HIA is a flexible but structured research and public engagement process used to elevate the consideration of health and equity in a decision-making process. An HIA involves impacted communities and uses scientific research to make predictions about how a plan, process, or policy would change health and equity outcomes, if implemented, and to provide recommendations about how the plan, process, or policy could be changed to be healthier and/or more equitable. The six step process and how it was applied is described below. This also includes a section on stakeholder engagement.

SCREENING

In the screening stage of an HIA, the objective is to decide if it would add value to the decision-making process to conduct an HIA on a proposed plan, process, or policy. Several HIA screening criteria were met when screening the SRTS LDSTP. The Plan would impact the health outcomes of students, their ability to increase levels of daily physical activity, and safety from crashes. *Columbus Public Health (CPH)* committed to coordinate the SRTS LDSTP in collaboration with TranSystems, the consultant engineering firm that was hired to create the LDSTP. Health indicators were certain to be taken into consideration by the consultants. However, the emphasis on health equity concerns brought up by CPH heightened the value of providing the structured, empirical, systematic analysis of an HIA.

The equity concern focused on decisions that would affect the funding of the countermeasures created by the plan. Not all Columbus City Schools will get the same consideration for infrastructure improvements. If the prioritization does not consider socioeconomic status; existing health of current student populations; and existing social and environmental obstacles that overburdened populations face, there is the potential to perpetuate student inactivity. This inactivity could be due to unsafe walking and biking conditions that health- and economically-disadvantaged populations often interact with. This could potentially result in a LDSTP that unintentionally deepens health disparities.

Additional screening criteria included: an HIA team that had the capacity and skills to move forward with an HIA, the access to data integral to the LDSTP process, and gaining buy-in from the *SRTS LDSTP Steering Committee*, a team of diverse stakeholders, to consider the predictions and recommendations made by the HIA when prioritizing the projects and countermeasures made by the plan.

SCOPING

An HIA scope sets the prioritized research questions the HIA will answer, identifies vulnerable populations to include for health equity purposes, defines geographic boundaries, and sets goals for conducting the HIA.

The main goal of this HIA is to ensure that once the LDSTP is developed, it does not perpetuate or increase health equity gaps in the Columbus City School District and throughout Columbus, Ohio. To this end, the HIA team started by creating a Level 1 analysis that examined equity indicators in order to identify 15 Focus Schools. For detail on the Level 1 analysis, see page 11. The Level 1 analysis defined the schools most impacted by health and social inequities.

Other goals that arose over the course of the HIA included having this HIA serve as a model for other STPs with regard to incorporating empirical research into equity considerations, and building the capacity of Columbus Public Health to conduct future HIAs.

The HIA Research Scope ultimately focused the Level 2 analysis on how the LSDTP would impact physical activity, traffic safety, crime, and the perception of crime and safety - specifically in the 15 focus schools. A Level 3 analysis was incorporated to further the consideration of equity by researching pertinent literature on how interventions proposed by typical SRTS processes impact equity indicators.

ASSESSMENT

In order to assess how the LDSTP would change existing conditions in the Focus Schools, and in CCS overall, the team conducted literature reviews. The literature review supported the secondary data gathered from MORPC, ODOT, the CCS Transportation Department, and the Columbus Division of Police. The Level 1 analysis described below included the mapping of equity indicators and the gathering substantial amounts of primary data in collaboration with the LDSTP planning process.

Systematic literature reviews were conducted for each of the three health determinants (physical activity, traffic safety, and crime/fear of crime) and their relationship to the SRTS countermeasures. The literature review also focused on how equity indicators would be impacted by the SRTS interventions. The databases used included Web of Science, PubMed, Academic One File, Academic Search Complete, Master FILE Complete, O Alster, World Cat, and Google Scholar. Peer reviewed articles were prioritized and weighted more heavily in terms of confidence of predictions, but grey literature from the Safe Routes to Schools National Program and other non-peer reviewed evaluations were included.

Primary data collection included:

- Parent Surveys – These surveys were distributed to every parent of a CCS K-8 student. A paper copy was sent home with students with a letter from CCS Superintendent Dr. Good explaining and supporting the survey. A prize that was awarded through a drawing was offered to students that returned the surveys. The survey asked for information about which factors affect whether parents allow their children to walk or bike to school, the presence of key safety-related conditions along routes to school, and related background information. Survey results will

help determine how to improve opportunities for children to walk or bike to school, while measuring parental attitude changes that could be attributed to SRTS countermeasures.

- Principal Surveys – These surveys were distributed to every CCS K-8 school principal in an online format that was developed specifically for completion by principals or other school administrators. Each administrator provided a list of barriers to walking and biking; common walking and biking routes; and other information related to encouraging or promoting walking and biking.
- Student Travel Tallies – These tallies were distributed to every CCS K-8 classroom in paper format. The tallies help to measure how students get to school and whether the SRTS Program affects trips to and from school. Teachers can use this form to record specific information about how children arrive to and depart from school on two days in a given week. The information this form collects will be used to help track the success of SRTS programs across the country by the National Center for Safe Routes to School.
- Principal and Administrator Interviews – Interviews were conducted with every principal, vice principal or administrative assistant as part of the walk audits conducted at every Focus School. These interviews gathered data about the total school enrollment, the fluctuation of the enrollment, the travel mode split of the students, the arrival and dismissal policies of the school, whether there was an adult crossing guard present, whether there was a student safety patrol present, where the crossing guards and student safety patrols were stationed, traffic or personal safety issues, whether a PTA was active at the school, after school programming, community partners of the school, community/parent engagement efforts, current SRTS programming, desired SRTS programming, the ethnic and cultural makeup of the school, and any other information that the interviewee thought was pertinent to the walking, biking, and safety conditions around the school.
- Perception Mapping: Parental concerns were collected verbally through three survey questions, and then spatially through a map on which participants marked the locations of their concern. These “Sketch Maps” and further details on the methodology can be found in the Crime/Fear of Crime section. This methodology is an innovative participatory-research tool developed by the Health and Hazards Lab at Kent State University by Dr. Jacqueline Curtis, who co-authored this HIA.
- Crime Data Mapping – The crime data obtained from the Columbus Division of Police and the Ohio Office of Criminal Justice Services was mapped by the Health and Hazards Lab at Kent State University. The data points consisted of all calls that the police responded to, and the majority were calls for service. Some were also runs that police did without being called.
- Remote Walk Audits –The travel plan consultant team, led by David Shipps of TranSystems, used 2013 digital orthographic maps to observe and analyze the infrastructure conditions around all of the Non-Focus Schools. This analysis was used to decide upon the Priority Corridors and any infrastructure improvements deemed necessary in order to provide students with optimally safe active transportation conditions.
- Walk Audits – These assessments were conducted at every focus school by members of both the School Travel Plan Steering Committee and the HIA Team during both arrival and dismissal times. During the morning arrival time members of the Steering Committee were on-site before student arrival to interview the school principal or other staff to gather first hand data about the school environment. They then observed the arrival patterns of the students and the conditions of the active

transportation infrastructure around the school. In the afternoon during dismissal time members of the HIA team interviewed parents or guardians picking up students. The HIA team used questions and maps from the perception mapping survey, all of which was recorded with audio recorders and some with video recorders. The video recorders were also used to record interviews with other residents, the dismissal patterns of students, and condition of the active transportation infrastructure around the schools.

Predictions were made based on the literature, the secondary data, the perspectives expressed by parents and school administrators in the community, and the results of the surveys described above.

STAKEHOLDER AND COMMUNITY ENGAGEMENT

Public engagement in the HIA included engaging the SRTS Steering Committee as the HIA Advisory Committee; conducting Perception Mapping Surveys at a majority of the Focus Schools (for further information about methodology, see the Assessment Section); participating in LDSTP data collection of Parent Surveys, Principal Surveys, and Student Travel Tallies; a city-wide SRTS kickoff in October 2013 which included information about the HIA; presentations at Columbus Neighborhood Health Advisory Committees, a district-wide principal meeting, the Columbus City Schools Wellness Committee, along with health fairs, schools events, recreation centers; and meetings with CCS upper administration and upper management about the HIA. All presentations and meetings served the dual purpose of informing the public about SRTS in addition to the health and equity impacts of the LDSTP.

REPORTING

The recommendations and predictions of the HIA will be disseminated to the SRTS Steering Committee in order to inform the countermeasures of the plan. The full version of the HIA will also be given to the School Travel Plan Steering Committee via email, and then it will be posted on the Columbus Public Health website. From there the results will be presented at Area Commission meetings, Columbus Neighborhood Health Advisory Committee meetings, professional conferences, and CCS Board meetings along with the full travel plan. It will also be sent to other stakeholders and decision makers such as ODOT, MORPC, the City of Columbus Department of Public Service, the City of Columbus Mayor's office, the Health Policy Institute of Ohio, and ODH.

Level 1 Analysis
The Columbus City School district has 94 schools which are eligible for Safe Routes to School projects and programming. Only schools with students from Kindergarten – 8th grades are eligible for SRTS funding, projects, and programming. The stated goal of this Health Impact Assessment is to encourage the allocation of interventions to schools and communities where health inequities exist. In order to accurately identify these schools, the HIA team provided a comprehensive analysis of the student populations and the neighborhoods in which they live.

Identifying Social Determinants of Health

While the influence of personal choice and genetics cannot be discounted, there is a significant body of evidence showing that a person's health is largely dictated by the social factors that exist in communities where they live. While there is no single list of agreed upon social determinants of health, there is consensus among governmental agencies, academics, and researchers on the types of economic and social conditions that drive health outcomes. There are significant differences in health outcomes of the varying populations within the United States. This is especially true in major metropolitan areas like Columbus, Ohio, which have a wide variety of neighborhoods exhibiting unique combinations of socioeconomic and racial demographics that contribute to the health of their residents, especially children. Where a child lives in Columbus has a profound impact on his or her future health outcomes.

The initial challenge was to identify priority schools for SRTS infrastructure and non-infrastructure countermeasures. The schools selected, and their student populations are located in communities that have demographic characteristics and social conditions consistent with negative health outcomes. By focusing SRTS countermeasures in the neighborhoods most likely to have health inequities, an opportunity exists to directly address some of the conditions that lead to poor health and injury. Safe Routes to School efforts have the potential to reverse negative health trends, while making these communities healthier and safer.

The HIA Advisory Committee agreed on a list of social, economic, academic, and health determinants and their indicators to consider when selecting the Focus Schools by reviewing multiple statistical sources and research articles. The data that was used in the analysis came from two primary sources. Census tract level data was accessed through the American Community Survey (ACS) datasets provided by the United States Census Bureau, while school level data was provided by both the Columbus City School District directly and accessed from the Ohio Department of Education's website.

Table 1. Social Determinants and Indicators used in Level 1 Analysis and their Data Sources

American Community Survey data by Census Tract			
Social Determinant	**Indicator**	**Dataset**	**Year(s)**
Income	Household income	Median household income in the past 12 months	2011 ACS 5 Year Estimate
Poverty	Percentage of persons below the federal poverty line	Poverty status in the past 12 months	2011 ACS 5 Year Estimate
High education	Percentage of persons age 25 and older who are college graduates	Educational attainment	2011 ACS 5 Year Estimate
Low education	Percentage of persons age 25 and older who have less than a 12th grade education	Educational attainment	2011 ACS 5 Year Estimate
Unemployment	Percentage of persons age 16 and older in the labor force who are unemployed	Employment status	2011 ACS 5 Year Estimate
Home value	Median value of owner occupied homes	Median value	2011 ACS 5 Year Estimate
Household crowding	Percentage of households containing 1.01 or more persons per room	Occupancy characteristics	2011 ACS 5 Year Estimate
Race	Percentage of individuals identifying as a race other than White	Race	2011 ACS 5 Year Estimate
Ethnicity	Percentage of individuals identifying as Hispanic or Latino	Hispanic or Latino	2011 ACS 5 Year Estimate
Language ability	Percentage of people age 5 and older that speak a language other than English at home	Language spoken at home	2011 ACS 5 Year Estimate
Parenthood	Percentage of households with children with a Male or Female householder and no spouse	Households and families	2011 ACS 5 Year Estimate
Child population	Percentage of population age 5 to 14	Age and sex	2011 ACS 5 Year Estimate

Columbus City Schools data by school			
Income	Percentage of students eligible for free and reduced lunch	Free and Reduced lunch	2012-2013
Race	Percentage of students identified as a race other than White	Race	2012-2013
Language ability	Percentage of students identified as English Language Learners	English Language Learners	2012-2013

Ohio Department of Education data by school			
Education	Percentage of students that passed state administered testing	School rating data	2012-2013 school year
Education	Performance Index score	School rating data	2012-2013 school year

Each school in the district that has K-8th grade students was analyzed. Because the issues

of poverty, education and housing are so highly correlated and collectively influence health outcomes, it was important to combine several data elements into a single index measuring overall socioeconomic status. Seven of the data points above were weighted and combined into a single index, assigning each census tract in Columbus with a score that indicated its relative socioeconomic status. This is a research approach taken by multiple academic investigators. The analysis was greatly influenced by the work of Dr. Nancy Krieger, the Public Health Disparities Geocoding Project, and the Harvard School of Public Health.[4]

In addition to looking at each school community quantitatively, the HIA team mapped each dataset (Appendix A). By looking at a spatial presentation of social determinants across the City of Columbus, and the location of elementary and middle schools, the SRTS Steering Committee could better decide which schools to recommend for SRTS interventions. Crucially, the mapping highlighted schools in close geographical proximity to one another, providing an opportunity for added impact, especially with regard to infrastructure countermeasures.

Creating School Profiles

In order to get a comprehensive picture of each school in the district, a profile was created for each eligible school containing the previously mentioned data elements. In addition, information such as the percentage of students that live with 0.5, 1, and 2 miles of the school were included. Students that resided outside the neighborhood that surrounded the school, such as school choice or lottery students, were not included in the profile.

In order to simplify the school selection process, all census tracts and schools were assigned a rank for each of the data indicators. For example, Sullivant Elementary ranks first in the district for the percentage of students eligible for free and reduced lunch and the census tract in which the school is located has the second lowest Socioeconomic Index score of any census tract in the city. These rankings, maps and student population numbers were developed into individual school profiles. The school profiles were discussed by the SRTS Steering Committee to generate a preliminary list of schools that the HIA would address. This preliminary list of 25 schools was further pared down by the SRTS Steering Committee to 15 Focus Schools so that the HIA could appropriately address each school.

The Following Criteria were Considered when Establishing the Final List of Schools:

1. Ranking of each school and census tract neighborhood on the social determinants of health indicators

The social and economic conditions found with each school and its community provided the majority of the input to the SRTS Steering Committee when generating a list of Focus Schools. The primary intention was to identify schools that have students experiencing inequities in both health and socioeconomic outcomes. The rankings provided the necessary data to do so. Based on the agency they were representing, members of the Steering Committee often placed an emphasis on one determinant over another, but ultimately the group came to a consensus on how to incorporate the data equitably.

2. Percentage of students living within a walking or biking distance to school

In order for SRTS to have a significant impact on walking and biking participation to and from school, there needs to be a substantial number of students living within a walkable or bikeable distance of the school. Schools that had a large proportion of attendees living

within 1 mile from the school were given extra consideration as the list of schools was being finalized. The SRTS Steering Committee saw a tremendous opportunity to recommend interventions in school neighborhoods that had higher densities of children in order to amplify the positive effects of increases in physical activity, traffic safety, and crime safety.

3. Percentage of students that live within the attendance boundary of the school that they attend

A substantial proportion of CCS students do not attend the neighborhood school that they are assigned to by home location. The district has a number of school choice mechanisms that permit parents to select which school their child will attend. As a result, some schools that ranked highly on social determinant elements because of their census tract location were not considered because a considerable proportion of their student population resided outside of the school's attendance boundary. These students often live well beyond acceptable walking and biking distances (within 2 miles from the school). Some of those students may also come from households that are not at risk for health inequities, and therefore are not the target population of this assessment.

4. Geographic location of the school within Columbus

When developing a list of Focus Schools for the HIA, it was important to the SRTS Steering Committee to select schools that were located in several different geographical areas of the city in the interest of spreading funding more equitably amongst eligible buildings. Columbus has multiple communities that have been historically home to low income families, persons of color, have had issues around crime, and overall experience negative health. Many of these neighborhoods are represented in the final list of Focus Schools.

5. Previous SRTS funding or programming at the school

While not a significant factor of consideration, it was important to be aware of any school that had previously received SRTS countermeasures, for two primary purposes. Foremost, schools that previously had not received SRTS countermeasures before may be highly interested in bringing the program to their students, especially in the interest of spreading SRTS funding more equitably amongst eligible buildings. Conversely, if a school had previously received SRTS countermeasures, there may be a tremendous opportunity to build on what had been done in the past, especially if school leadership was previously involved.

6. Stability of school staff and parent leadership

Columbus City Schools is a large, urban district that experiences high levels of student, administrative, and staff mobility between schools, neighborhoods and residences. This is especially true in the Focus Schools. Many students move to new neighborhoods, principals are reassigned to different buildings, and teachers leave the district for other opportunities. As a result, much of the stability and continuity of a school's philosophy and culture can be lost, making it difficult for programs like SRTS to get a foothold in a school community. Individual schools that had strong and stable leadership and parent organizations were given additional considerations.

The Final List of Focus Schools
After multiple discussions, the SRTS Steering Committee finalized a list of 15 Focus Schools to prioritize for SRTS interventions as part of the LDSTP.

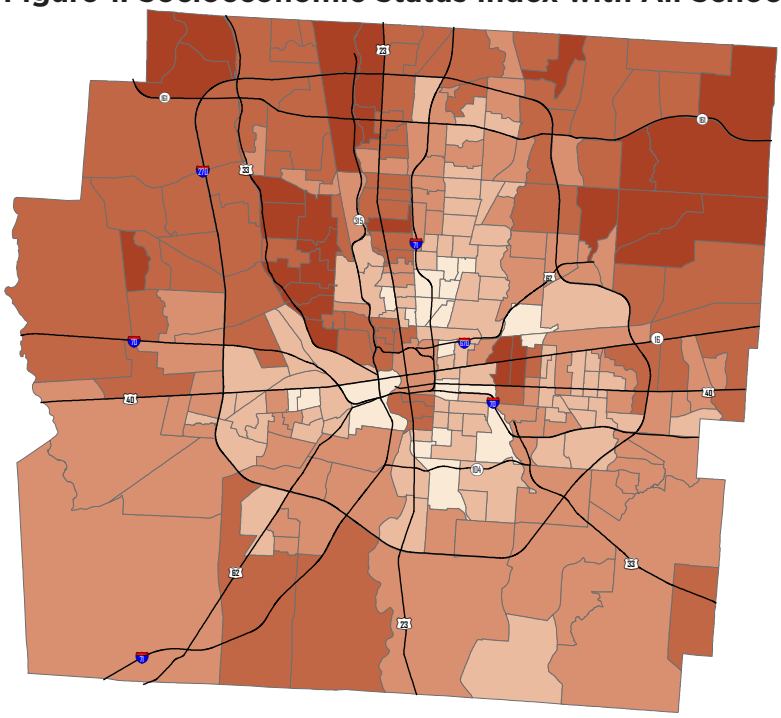
Additional information and rankings on each school can be found in Appendix A.

Table 2. Final List of Focus Schools

School Name	Grades	Neighborhood	2013-2014 Enrollment
Avondale	K-5	Franklinton	372
Champion	6-8	King-Lincoln Bronzeville	264
Eakin	K-5	Holly Hill	342
East Columbus	K-5	East Columbus	490
Fairmoor	K-5	Eastmoor	446
Hamilton	K-5	South Linden	474
Highland	K-5	Central Hilltop	310
Lincoln Park	K-5	Lincoln Park/Vasser Village	373
Livingston	K-5	Southern Orchards	482
Ohio Avenue	K-5	Old Town East	337
Starling	K-8	Franklinton	616
Sullivant	K-5	South Franklinton	295
Trevitt	K-5	Mount Vernon	343
Weinland Park	K-5	Weinland Park	394
Windsor	K-5	South Linden	524

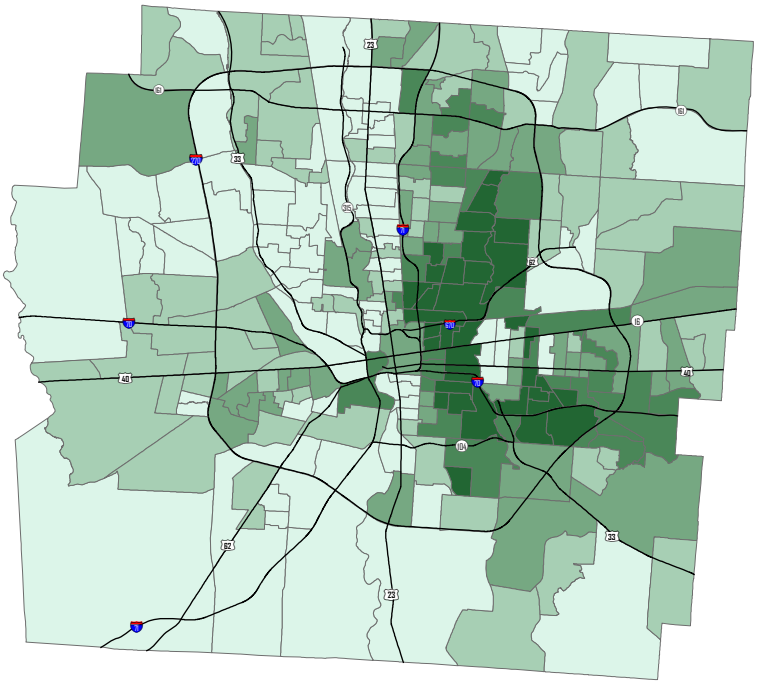
Some of the primary equity indicator maps are included here.
(Note that the study area is divided by census tracts)

Figure 1. Socioeconomic Status Index with All School Locations



In Figure 1, note that the lighter areas, that are generally near the central core of the city, indicate higher levels of vulnerability. This means that the socioeconomic status index includes high poverty, low incomes, low educational attainment, overcrowding along with other housing issues.

Figure 2. Individuals Identifying as a Race Other Than White



In Figure 2, the darker areas of the city have higher proportions of individuals who are not white. The darkest areas range from 73% - 98% Non-White, and the lightest areas on the map are between 0 – 14% Non-White.

Figure 3. Percentage of People Speaking a Language Other Than English at Home

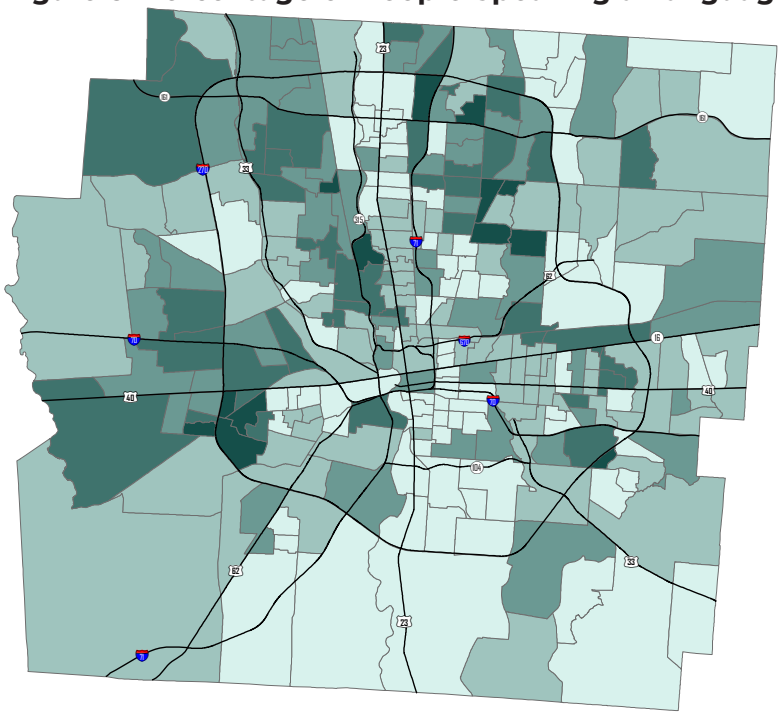


Figure 3, the darker areas have higher proportions of people who speak a language other than English at home. Darker census tracts have between 27% – 51% of their populations speaking a language other than English at home, and lighter census tracts have between 0% - 6% of their populations who speak a language other than English at home.

Health Equity Analyses

In each of the three topic areas – Physical Activity, Traffic Safety, and Fear of Crime – we provide the existing conditions in the Columbus City Schools, specifically in the Focus Schools. Furthermore, we discuss what the scientific literature says; what the community says; and our predictions about how the Large District School Travel Plan could change the current baseline conditions.

PHYSICAL ACTIVITY

PHYSICAL ACTIVITY

EXISTING CONDITIONS

Columbus City School District
The Columbus City School District is located in the City of Columbus, a largely urban area, with an average population density of 3,624 persons per mi^2 based on 2010 U.S. Census Data.[5] Many of Columbus' inner city neighborhoods have opportunities for redevelopment due to preponderance of vacant buildings and parcels. The predominately grid street pattern and the largely traditional and neo-traditional neighborhood developments throughout much of the Columbus City School District creates a basic street network and neighborhood design that is conducive to a utilitarian use of active transportation to meet the daily transportation needs of residents. When paired with Columbus' extensive off-street, multi-use path system, Columbus is well suited for both utilitarian and recreational uses. Both environments are conducive to the increase in levels of physical activity when well maintained and regularly updated to ensure safety and accessibility.

Overweight and Obesity
In 2011, 31% of the general population in the Columbus Metro Area had body mass indices (BMI) high enough to consider them obese. As in many urban areas in the United States obesity levels in Columbus, Ohio have reached levels that pose a threat to the long-term health of the entire community. The proportion of CCS students with BMIs indicating that they are at risk for obesity steadily increases from kindergarten until 7th grade in every school year recorded (from 2007-2014) except the 2008-2009 school year. Specifically, 26%-43% of kindergarten students and 44%-47% of 7th grade students (from 2007-2014) have BMIs indicating that they are at risk for obesity. Looking at all years recorded we see a 50-60% increase of students that are at risk for obesity from kindergarten until 7th grade.[6] Between 7th and 9th grade, BMI levels start to drop to the levels found in 5th graders; however, they never fall below the levels in kindergarten and 3rd graders. This is an unacceptably high percentage of CCS students at risk for obesity.

Active Transportation to School (walking and biking)
Active transportation can play a huge role in increasing the daily physical activity that K-8 students engage in by making it easier for them to travel to and from school without the use of motorized vehicles. Active transportation is a practical, feasible and highly effective way for both youth and adults to achieve levels of physical activity that can counteract obesity, diabetes and other chronic diseases that disproportionately affect disadvantaged populations.

The 2014 Columbus City Schools Parent Survey that was sent home with every CCS K-8 student found that 36% of students walk to or from school in the 15 Focus Schools compared to 13% in all other schools. Rates of walking are strikingly higher in the Focus Schools as are the crash rates involving pedestrians and bicyclists (see Traffic Safety section). The Parent Survey results entailing all schools, including both Focus and Non-Focus Schools and a disaggregated analysis of the Focus Schools, have 0.25% of students

biking to or from school. Bicycle ridership is 89% lower in CCS (0.25%) compared to the national average of SRTS parent survey results (2.2% in 2012).[7]

The CCS Student Travel Tally, administered in most CCS K-8 classrooms, showed that 33% of students in the Focus Schools walked or biked to and from school compared to 12% of students in all other CCS schools. The CCS Focus Schools have higher disadvantaged populations and higher rates of active transportation. This aligns with the literature, which finds that minorities and lower income populations are more likely to use active transportation for utilitarian purposes, including commuting to school and work. [8] [9] [10] [11] Specifically, McDonald analyzed the National Personal Travel Survey, which showed that minority students are twice as likely to walk to school as whites. Additionally, children from households with incomes below $30,000 were more likely to walk.[12]

Columbus Parents' and Principals' Barriers to Student Active Transportation to School
Distance was reported a barrier for 53% of Focus School parents vs. 70% of parents in the Non-Focus Schools. This leads to the general conclusion that students attending Focus Schools live in more dense, higher population areas than students attending Non-Focus Schools. Distance was ranked 5th as a barrier to active transportation to school among Focus School parents, while it was ranked 1st among parents in Non-Focus Schools. According to the Parent Survey, 22% of all K-8 grade CCS students live within ¼ mile of school. In the Focus Schools 43% of students live within ¼ mile of school compared to 18% in the Non-Focus Schools. Because rates of bicycling are the same for both Focus and Non-Focus schools, it appears that bicycling can overcome the distance barrier to some extent, or is less affected by distance constraints.

In CCS, 33% of parents reported time as barrier to letting their children walk or bike to and from school. Many parents have demanding schedules that don't allow them much time to transport their students to and from school. This also restricts students' access to extracurricular activities that are especially important not only for physical activity, but also for positive socialization.

Other barriers include: intersection and street design is also a barrier; 40% of parents listed the lack of sidewalks and crosswalks as a barrier to active transportation; safety of intersections was a barrier for 54% parents at Focus Schools and 58% of all other schools parents; and sidewalk and pathway issues were listed as barriers to letting their children walk or bike to school by 32% of Focus School parents and 42% of Non-Focus School parents.

LITERATURE REVIEW

There is an Association Between Active Transportation to School and Overweight / Obesity.
Studies that consider how active transportation reduces BMI report small decreases, or simply stabilized BMI rates. None report increases of BMI with increases in active transportation.[13] [14] [15] As an example, implementing a Walking School Bus in one study found that the average BMI dropped from the 51st percentile to the 49th percentile pre- and post-Walking School Bus. This decrease was small, yet all of the participating students reported that they were walking more. Eighty two percent of them reported that they were playing more active games.[16]

Other studies draw conclusions for specific populations: that active transportation to school results in lower BMI for overweight children; [17] there is an association between active transportation and lower BMI in 4th and 5th grade boys;[18] or that students who actively commute daily prevent 2-3 pounds of weight gain per school year with all other factors being held constant.[19]

The Research Shows that Active Transportation, Such as Walking and Biking, Positively Impacts Overall Physical Activity Levels.[20 21 22 23 24 25 26 27 28]
Davidson, for example, found that children who bike and walk to school have higher levels of daily physical activity and McDonald showed specifically that using active transportation to school accounts for 20 minutes of daily physical activity on average.[29 30]

Population and Housing Density Affects Levels of Physical Activity and Active Transportation.
For example, one study found that higher levels of out-of-school-hours physical activity and walking are significantly associated with higher levels of urban density and neighborhoods with mixed-use planning.[31] Another study concluded that out of the factors of 'minutes spent in a car', 'kilometers walked', 'age', 'income', 'educational attainment', 'gender' and 'land-use mix', that land-use mix had the strongest association with obesity. Each quartile increase in land use mix was associated with a 12% reduction in the likelihood of obesity.[32] While the amount of kilometers walked per day has the second strongest relationship, with a 5% reduction in the likelihood of obesity. A Canadian survey found that about 57% of adults rated local street-scale urban design as highly important in determining the amount of physical activity they obtain.[33] In conclusion, one factor that may have to do with higher rates of walking in the Focus Schools is the higher population and housing densities around these schools. The population density often creates a more conducive built environment to walking, which helps to alleviate the barrier of distance. However, the safety of the environment is also a major factor to be taken into consideration.

Proximity and Connectivity to Schools and Places for Exercise Increases Physical Activity.
Several studies have shown that increasing access to recreational opportunities raises levels of physical activity, and can also raise the rates of active transportation.[34 35 36 37] For example, children residing in neighborhoods with access to services and parks through a well-connected sidewalk system are significantly more likely to engage in less screen time, and more physical activity.[38] Youth who have better neighborhood access to parks, playgrounds, and recreational facilities display higher levels of physical activity.[39] Furthermore, proximity and connectivity to local destinations such as schools and commercial land uses determines whether children receive parent permission to walk to local destinations which raises the levels of physical activity in children.[40 41 42 43]

ENGINEERING

SRTS Impacts Active Transportation
One study author summarized findings that guide most SRTS efforts: "children are more likely to walk or bicycle to school when they live in urban neighborhoods and when road and sidewalk infrastructure (e.g., presence of controlled intersections, direct routes to school, few hills) and social norms support active commuting".[44] Safe Routes to School focuses on K-8th grade students and strives to create an environment similar to the above-mentioned conditions.

Engineering and Infrastructure Impact Physical Activity.
While SRTS engineering improvements such as high visibility crosswalks, multi-use paths, traffic calming features, and sidewalk improvements are time and cost intensive, the outcomes are undeniable. Levels of active transportation to school and physical activity are higher in areas with a supportive system of infrastructure such as sidewalks, bicycle lanes, controlled intersections, and multi-use paths.[45] [46] [47] [48] [49] [50] [51]

For example, Gustat et al. studied three low-income African American neighborhoods: one with a recently built 6-block walking path adjoining a playground, and two other comparison neighborhoods without any improvements. They found that 41% of residents were observed engaging in moderate to vigorous physical activity in the neighborhood with the walking path compared to 24% and 38% in the comparison neighborhoods.[52] Other research has found that sidewalks and traffic signal improvements can result in increased active transportation and safer pedestrian–automobile interactions.[53] [54] [55] [56] [57] [58] Perceived traffic safety and better pedestrian infrastructure is more strongly correlated with adolescents' use of walking/biking for transportation in Boston, Cincinnati, and San Diego than with land-use mix, street connectivity, aesthetics, and the threat of crime.[59]

Specific to SRTS programming, an evaluation of California Safe Routes to School improvements found that students who took routes to school that passed SRTS infrastructure projects showed a 15% increase in walking or biking to school verses a 4% increase by students who didn't pass by a completed infrastructure project.[60] In Columbus, the presence of sidewalks, crosswalks, and other active transportation infrastructure is a major concern of parents when deciding on permitting their children to engage in active transportation to school. The CCS 2014 parent survey found that 40% of parents of students that don't currently walk or bike to school listed the presence of sidewalks and pathways as an issue that affected their decision.

Engineering Impacts Bicycling Specifically.
Infrastructure improvements can affect bicycle ridership. One pre- and post-construction study of a newly striped bike lane in New Orleans, Louisiana showed a 133% increase in female riders, and a 44% increase in male riders after the bike lane was striped.[61] It has also been found that girls have significantly lower levels of physical activity compared to boys.[62] [63] One study found that 81% of girls were sedentary compared to 92% of boys, who were more active.[64] Given that girls have lower rates of physical activity, an emphasis should be placed upon encouraging girls to participate in physical activity.

People who ride a bicycle prefer to use bike lanes and other bicycle specific infrastructure when they do so. A study on the role of bicycling infrastructure found that U.S. cyclists rode on bicycling infrastructure for 49% of their travel miles, even though only 8% of the overall U.S. transportation network entailed some type of bicycling infrastructure.[65] Bicyclists overwhelmingly prefer to ride on bicycling specific infrastructure such as separated bicycle lanes, multi-use paths, and bicycle boulevards. Given that active transportation can raise levels of physical activity, and that people who ride a bicycle prefer riding on bicycling specific infrastructure, this infrastructure can therefore have positive impacts on users' health. More specifically, a study in a lower income neighborhood found that of 1,282 cyclists in a newly striped bike lane; 55% were Non-White; 69% lived locally; 61% were of normal weight; and 65% met recommended levels of physical activity. When compared with neighborhood residents overall, the cyclists reported better health and health behaviors.[66]

Extrapolating from the previous research, we conclude that the low rate of bicycling in the Columbus City School District is at least partially due to the lack of bicycling specific infrastructure in the Columbus City School District and if a well-connected system of bicycle infrastructure is implemented in close proximity to schools it can not only raise the rates of bicycling to school, but also raise levels of physical activity.

Beyond SRTS, Overall Neighborhood Design Affects Active Transportation

We know that land use and neighborhood design affects the travel habits of adults, and adult travel patterns impact the active transportation behaviors of children. In one study, positive perceptions of neighborhood accessibility to desired locations such as shopping, recreation, entertainment, and employment led to a 13% increase in walking as a mode of transportation when combined with high levels of self-efficacy (one's belief in ability to complete tasks).[67] Another researcher found that land-use mix had the strongest association with obesity, out of the following factors: minutes spent in a car, kilometers walked, age, income, educational attainment, gender and land-use mix. In fact, each quartile increase in density of land use was associated with a 12% reduction in the likelihood of obesity.[68] The amount of kilometers walked per day had the second strongest relationship, with a 4.8% reduction in the likelihood of obesity.

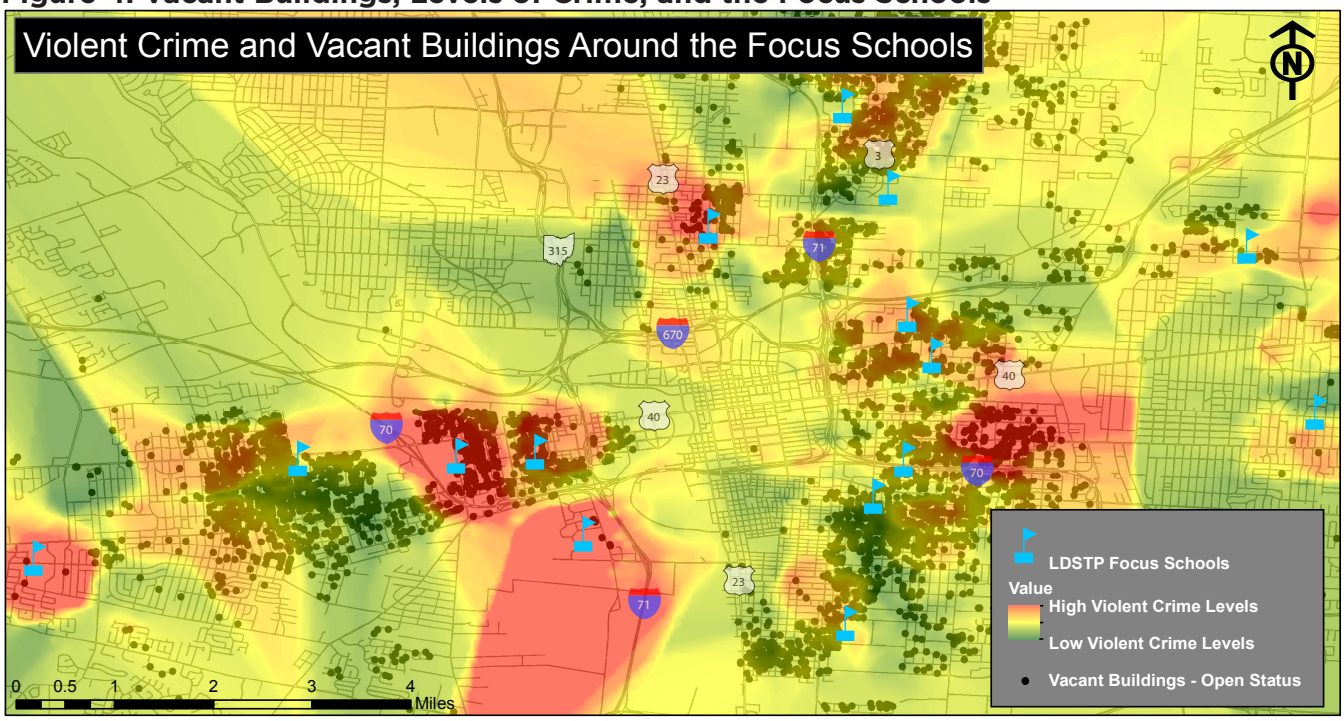
Higher degrees of urban density and walkability have been found to raise levels of walking.[69] [70] [71] [72] Learnihan et al. found that participants who lived 15 minutes from their destination were 3 times more likely to walk to their destination for non-recreational purposes.[73] Finally, another study showed that areas experiencing high levels of urbanization have 1.2% higher levels of walking, while areas with lower levels of urbanization have 6% higher of levels of bicycling when the types of areas were compared to each other.[74]

As evidence shows, land use and population density affect the levels of active transportation. The City of Columbus has a moderate urban housing density of 1,708 housing units per mi^2.[75] However, many neighborhoods have opportunities for redevelopment due to preponderance of vacant buildings and parcels found in our first hand analysis.

Vacant Housing

Figure 4 shows the vacant buildings in Columbus, Ohio as black points with the Focus Schools as blue school building symbols. The map clearly displays a concentration of vacant buildings in close proximity to most of the Focus Schools. Vacant buildings were brought up verbally by residents as a concern for student safety at the walk assessments. Not only do they provide a place to commit crimes for adults, they also have been reported by residents to be used by older students (high and middle school students) to hang out while being truant from school. The lack of upkeep of the parcel that the buildings are located on also pose a sight line issue for drivers, and overgrown vegetation also forces pedestrians onto the parallel roadways. Vacant buildings are both an issue that needs to be addressed for crime and traffic safety reasons, as well as an opportunity to build newer housing stock on the vacated parcels to provide better quality housing for low income residents.

Figure 4. Vacant Buildings, Levels of Crime, and the Focus Schools



Urban Design's Impact on Adult Perceptions

A study of elementary school students found that areas with a high percentage of sidewalk coverage encouraged a significant percentage of students to walk to school independently as well.[76] We also know that the habits of parents can directly affect the habits of youth, and what adults find important to stimulate physical activity can lead to higher levels of physical activity in youth.[77] [78] One study found that 57% of adults rated the design of their streetscapes as highly important for exercise.[79] Another study found that urban form is a significant factor in a parent's decision about their child's mode of travel.[80] Additionally, parental concerns of roadway safety have been linked to a higher risk of being overweight for adolescents.[81] Overall, how built environment is perceived by adults that are involved in the lives of youth plays a major role in determining whether or how often youth is allowed to engage in active transportation.

While it is a deciding factor, simply improving the infrastructure around a school will not overcome every barrier to active transportation to school. SRTS funding highly prioritizes the built environment portion of SRTS by allotting 85% of the funding to infrastructure improvements. Multiple studies of SRTS overwhelmingly conclude that the successes of the program revolve around the engagement of school administrators, teachers, parents, and community groups. This engagement is most effective when done by a paid staff.[82] [83] [84] One study quantified this finding by comparing schools that only had engineering changes to schools that had "other E's", like programs (Encouragement and Education), media campaigns (Encouragement and Education) and crossing guard staffing (Enforcement). The study found that on average if a school had only engineering changes, there was a 2% increase in active transportation, but if a school had both engineering changes and one or more of the other E's, there was a 5.6% increase in active transportation.[85]

ENCOURAGEMENT

Measurable Outcomes from Encouragement Programs in Other Places
Encouragement plays an important role in increasing the use of active transportation, and therefore increasing the rates of physical activity.[86] [87] Encouragement can take many forms. The most commonly cited program is the Walking School Bus which has many good outcomes in many different geographical locations (see below). In addition, schools can implement other encouragement activities such as marketing, outreach to different groups, media campaigns, and other promotional activities.

Activate Omaha is an initiative that promoted the use of active transportation for transport and exercise. Active Omaha found increases in physical activity after evaluating one of its' initiatives; the Bicycle Commuter Challenge. The Bicycle Commuter Challenge had a 200% increase in participation and a 76% increase in miles cycled in 2008 compared to the same challenge in 2006.[88] Another active transportation initiative in Jackson, MI called Project U-Turn had multiple positive outcomes from their encouragement efforts. Their Walking School Bus had an increase of participation of 315% (165 participants to 520) over the course of 4 years.[89] Project U-Turn also measured daily active transportation levels at 15 locations throughout the city. They found a 63% increase in the use of active transportation over the course of a year during which they were actively engaging in encouragement efforts. They also doubled their participation in Walk and Bike to School Day over the course of 5 years (600 to 1200 students). Levels of physical activity were raised with events and challenges which were promoted through media, websites, and newsletters. Walking and biking programs were found to save the school district more than $500K per year by replacing some of the bus routes.

Project U-Turn focused much more time and effort on education and encouragement projects over infrastructure projects. Activate Omaha focused heavily on the promotion of education and encouragement initiatives through social media, working in tandem with infrastructure projects. In either case, the overall success of the initiatives can be largely attributed to the education and encouragement initiatives.

Walking School Bus Successes – Which Led to Increased Funding
Walking school buses are very effective and have been widely used across the country. Project U-Turn found that their Walking School Bus program had gained nearly 60 students from 6 adult-led groups of walkers, but flattened after the SRTS funding application was completed due to a waning interest in students and staff. Even so, it played an important role in encouraging walking, and led to the securing of funding for active transportation infrastructure improvements.[90]

In Columbia, MO the Walking School Bus was the most successful program of their Active Living by Design project.[91] In less than 4 years the Walking School Bus program grew from 30 students and a few volunteers to 400 students from 14 schools that were led by 120 trained volunteers. Much of the sustained success of the program was due to a paid school-based coordinator who organized the Walking School Bus program. The Active Living by Design Walking School Bus program was also able to increase the physical activity of students that were regularly driven to school by using an alternative parent drop-off location. The students gained 15 minutes of physical activity by walking through a park to get to school instead of being dropped off on the school property. The Walking School Bus program was a big part of Columbia's Active Living Partnership, which resulted in

a $22M federal grant to build and promote a city-wide network of active transportation infrastructure.

Finally, a Walking School Bus program in Seattle increased the levels of walking in a largely minority student population composed of 47% African American, 22% Latino, and 23% Asian students, with 92% of all students qualifying for free or reduced meals.[92] A pre and post-intervention survey of the students found a 25% increase in the number of students walking to school. The vast majority of the increase was attributed to having adult supervision when walking to school. The program also decreased the number of students arriving by parent drop-off, and no students were injured during the Walking School Bus programming efforts. The evaluation concluded that a Walking School Bus can be successfully implemented in a low-income and multi-ethnic school community that is demographically similar to the Columbus City School District.

However, paid staff is vital to the sustainability of all programming efforts, specifically the Walking School Bus encouragement program. One study found that 50% of Walking School Buses ended after 1 year due to the lack of volunteers.[93] Another study showed that low-income schools with paid staff who were implementing SRTS were able to generate program activities more frequently than schools relying on volunteers[94]. The requirement of a statewide SRTS coordinator is inherent in all of statewide SRTS best practices guides.[95]

Parental Encouragement

Even though SRTS programming targets K-8 grade students, engaging and educating parents must also be taken into consideration as they influence the development of health behaviors, attitudes, and the habitats of their children. [96] Specifically, parental support of physical activity, such as encouragement programming, influences physical activity in children in a positive manner. [97] Therefore, educating parents about SRTS and the benefits of physical activity will garner support for, and is a key to the successful implementation and sustainability of SRTS. This is especially true at a community level.

Children that have parents who are involved in the program they are participating in tend to have better outcomes than those children that do not have their parents involved. A study conducted with children and their parents enrolled in a pediatric obesity treatment program, demonstrated that parents who were the *least* involved with the program had children who were 8 to 10 times more likely to have nominal or no weight loss. [98] In addition, educating parents about SRTS will enable parents to appropriately model behaviors to their children, and therefore improve the child's health. [99] [100]

Time and convenience are barriers to parental participation in their children's active commute to school. This has led to the currently high levels of parent drop-off by motor vehicle, 39% in CCS, and the concurrent lower levels of active transportation which hover around 16% in CCS. The Walking School Bus programming can help overcome the lack of parental time and convenience which were barriers to 44% of focus school parents and 47% of all other school parents by picking students up at their place of residence.

Policies as Encouragement

In a comparative analysis of programs that had successfully increased walking and biking to school with those that had not, one of the top four things that successful schools have done was to establish policies that support SRTS. These include allowing students who walked or bicycled to be dismissed a few minutes earlier than those who did not.[101] Additionally, providing active transportation language in school travel policy statements that are presented to parents could result in greater changes in travel behavior than if the language was left out. [102]

PREDICTIONS

How will SRTS interventions impact rates of obesity and physical activity in our target populations?

OBESITY

PREDICTIONS	EVIDENCE	RECOMMENDATIONS
The proportion of students with BMIs putting them at risk for obesity would stabilize at 31% of the CCS population or possibly decrease in the Focus Schools as students progress from kindergarten - 7th grade.	**I)** Average BMI percentile dropped from the 51st percentile to the 49th percentile pre and post walking school bus implementation. **II)** Children are more likely to walk or bicycle to school when they live in urban neighborhoods and when road and sidewalk infrastructure (e.g., presence of controlled intersections, a direct route to school, few hills) and social norms support active commuting."	See Physical Activity section
SRTS efforts could effectively reverse the trend of increasing obesity rates seen district-wide or at the very least stabilize the proportion of students at risk for obesity.	**I)** Students who actively commute daily prevent 2-3 pounds of weight gain per school year with all other factors being held constant.	See Physical Activity section
Fourth and fifth grade boys and overweight students will notice slightly lower BMIs and a stabilization of weight. While SRTS programming will have variable effects on students' weight and overall the impact on the student population will be small in the overall population.	**I)** Active transportation to school resulted in lower BMI for overweight children, and studies show an association between active transportation and lower BMI in 4th and 5th grade boys specifically. This age appears to be a tipping point for BMIs for boys in CCS, such that increasing active transport at this time is beneficial.	See Physical Activity section

ENGINEERING

PREDICTIONS	EVIDENCE	RECOMMENDATIONS
Physical activity will rise in school populations and in the neighborhood populations where SRTS interventions are implemented.	**I)** Living in a highly walkable neighborhood is associated with 7 more minutes of moderate-to-vigorous physical activity, more walking and cycling for transportation and recreation, and less motorized transport. **II)** Children who actively commuted to and from school spent 19% more time in moderate intensity physical activity compared with their driven peers. "	**1.** Build new or improve existing sidewalks and install traffic signals as a countermeasure within ¼ mi of schools. **2.** Properly maintain new infrastructure.
Building new or improving existing sidewalks to increase the amount and connectivity of the sidewalk network, installing traffic signals within ¼ mi of schools, or creating crossing and intersection treatments such as rapid flashing beacons, signage, hi-visability crosswalks and pedestrian islands will result in a 10-15% increase in walking at that school where there is current lack of sidewalk connectivity and safe crossings.	**I)** A California SRTS evaluation found that students who took routes to school that passed SRTS infrastructure projects had a 15% increase in walking and biking to school verses a 4% increase by students who didn't pass by a completed infrastructure project (sidewalk construction or improvements, crossing treatments and installation of traffic signals that were constructed within ¼ mi of a study school). **II)** Areas with a high proportion of sidewalks showed a significant percentage of elementary school students walking to school independently. Urban form is a significant factor in a parent's decision about their child's mode of travel. **III)** Children residing in neighborhoods with access to services and parks through a well-connected sidewalk system were significantly more likely to engage in less screen time and more physical activity. Safety of intersections were a barrier to 54% of Focus School and 58% of Non-Focus School parents. **IV)** Sidewalk and pathway issues were listed as barriers by 32% of Focus School parents and 42% of Non-Focus School parents. **V)** Parental concerns of roadway safety have been linked to a higher risk of being overweight for adolescents. **VI)** A CCS parent survey found that 40% of the parents of students that don't currently walk or bike to school listed the presence of sidewalks and pathways as an issue that affected their decision."	**3.** Implement traffic calming infrastructure such as chicanes, bulb outs, pedestrian islands, landscaped medians, hi-visibility crosswalks, rapid flashing beacons and street diets as improvements around schools that experience high volume and high speed traffic. Examples of such schools in the Columbus City School District are Starling K-8, Highland Elementary, Livingston Elementary, Fairmoor Elementary, East Columbus Elementary, Ohio Avenue Elementary, Windsor Elementary, Hamilton STEM, Weinland Park Elementary and Lincoln Park Elementary.
There will be a 40% increase in the rate of bicycling at Focus Schools if bicycling infrastructure improvements such as separated bike lanes or sidepaths on arterial and collector streets, bicycle boulevards on local streets, and multi-use paths off-street, along with traffic calming measures such as chicanes, bulb outs, and traffic circles are increased in amount and placed within ¼ mi from that particular focus school.	**I)** There was a 133% increase in female riders and a 44% increase in male riders on a street segment in New Orleans, LA after a bike lane was newly striped. US cyclists rode on bicycling infrastructure for 49% of their travel miles although only 8% of the overall transportation network had bicycling infrastructure. Thus, people prefer dedicated bike lanes and routes. **II)** Having lower incomes is related to more cycling for transport and less motorized transport. **III)** 55% of CCS Focus School parents and 58% of all other schools parents listed speed of traffic as a barrier to active transport."	**4.** Provide bicycling facilities such as separated bike lanes on arterial roadways, bicycle boulevards on local street with traffic calming measures such as chicanes, bulb outs, and traffic circles. **5.** Connect any proposed bicycle infrastructure to the existing bicycle infrastructure to ensure that any proposed infrastructure connects to the existing bicycling infrastructure to provide a safe, desirable and low-stress network of bicycling facilities."

Engineering Predictions, continued

Schools located in residential developments where many amenities are located within a ½ mi of most residences, and where all students live within ½ mi of the school, along with an overall perception of safety, will have 2- 3 times more students walking to school compared to schools in neighborhoods that lack those characteristics. Schools in neighborhoods lacking those characteristics will have up to 5% more students that bicycle to school than higher density neighborhoods if bicycling infrastructure in combination with education and encouragement programming are also implemented at that school.	**I)** Positive perceptions of neighborhood accessibility to locations such as shopping, recreation, entertainment, employment lead to a 13% increase in walking for transportation. Good land-use mix has a strong association with lower obesity. Each quartile increase of land-use mix was associated with a 12% reduction in the likelihood of obesity. **II)** People who live 15 minutes from their destination are 3 times more likely to walk for non-recreational purposes. Highly urban areas have 1.2% higher levels of walking and areas with low urbanization have 6.1% higher of levels of bicycling. **III)** Proximity and connectivity to local destinations such as schools and commercial land uses determines whether children receive parent permission to walk to local destinations. "	**6.** Place infrastructure countermeasures suggested in the LDSTP along the priority corridors (routes created by the school travel plan that denote the safest way to get to school for the highest percentage of students attending a school) to create a well-connected system of active transportation infrastructure within 1 mile of K-8 schools that connects the schools to student residences, recreational facilities, and healthy food options. **7.** The LDSTP should focus on pedestrian infrastructure for schools located in higher density areas and remote drop-off locations for schools in less dense neighborhoods. **8.** Columbus City Department of Development should encourage redevelopment in lower income neighborhoods and require an average urban density of 9,600-12,800 Housing Units per mi2 for new development. New Urbanism principles identify this level as "high density" to support the outcomes of walkability and connectivity."

ENCOURAGEMENT

PREDICTIONS	EVIDENCE	RECOMMENDATIONS
Increasing walking and biking in Focus Schools will require a sustained, community-wide effort.	**I)** 36% of students walk to or from Focus Schools compared to 13% in all other schools. **II)** Biking to schools is the same in Focus Schools and all schools: 0.25% of students bike. **III)** The National Personal Travel Survey evidence is that minority students are twice as likely to walk to school as whites and children from households with incomes below $20,000 are more likely to walk. **IV)** While walking rates are high at Focus Schools, so are collisions.	**1.** Many of specific traffic calming measures could be captured in a complete streets policy that accommodates all roadway users (pedestrians, bicyclists, transit users, personal automobiles and commercial trucks) equally on new roadways construction or repaving projects. We recommend that the City of Columbus adopt a complete streets policy that prioritizes implementing in infrastructure and community engagement the neighborhoods surrounding the focus schools.
Encouragement efforts (e.g., Bicycle Commuter Challenge, Walking School Buses [WSB], Walk and Bike to School Days) and using social media to publicize these efforts will increase walking and biking to and from school in Columbus. Multi-faceted, city-wide education & encouragement (E & E) funded for 4 or more years will result in a 30% increase in active transportation use by students in the schools where it is implemented.	**I)** Active Omaha focused heavily on active transportation promotion through social media along with education and encouragement projects all working in tandem with infrastructure projects. **II)** Evaluation of Activate Omaha's Bicycle Commuter Challenge saw a 200% increase in participation and a 76% increase in miles cycled in 2008 compared to the same challenge in 2006.	**2.** Increase funding for Encouragement and Education to support a full-time SRTS coordinator staff person to run programming. Increased funding could be from ODOT; other SRTS Steering Committee member organizations could co-fund the position; or the SRTS Steering Committee could work together to find grant sources. **5.** The SRTS coordinator should create and carry out an Encouragement Plan to tailor innovative encouragement efforts that meet the unique needs of the Columbus City School student population.
A walking school bus program will increase walking to schools throughout the Columbus City School District. Participation in walking school busses will increase by up to 80% per year.	**I)** Project U-Turn had an increase of participation in the walking school bus of 315% (165 participants to 520) over the course of 4 years.	**3.** Create and maintain a walking school bus encouragement program. To do this, employ a paid staff member to coordinate the program throughout the district. The job description should explicitly identify that the coordinator spend more time in focus schools, as barriers to parental participation (for example, to volunteer for walking school buses) in these schools can require extra time and effort. **4.** Hire a paid WSB coordinator. The paid WSB coordinator must maintain an active volunteer base to lead the WSB."

PERCEPTIONS

PREDICTIONS	EVIDENCE	RECOMMENDATIONS
Increasing amount of sidewalks, bicycle boulevards, multi-use paths and intersection treatments such as rapid flashing beacons, signage, hi-visibility crosswalks, bumpouts and pedestrian islands will respond to parental concerns of safety and accessibility.	**I)** 54% of CCS Focus School parents felt that safety of intersections was a barrier; 58% of Non-Focus School parents also felt this way. **II)** Specifically, sidewalk and pathway issues were listed as barriers to letting their children walk or bike to school by 32% of Focus School parents and 42% of Non-Focus School parents. "	**1.** Ensure that Focus Schools and non –Focus Schools have intersections treatments to aid safety such as flashing beacons, signage, crosswalks, and pedestrian islands on priority corridors and at major intersections.
If a well-connected system of sidewalks, bicycle facilities and roadway crossings increases and is maintained, more students will be permitted to walk and bike to and from school.	**I)** 56% of CCS students live within ¼ mile of school. 30% of all students asked their parents if they could walk or bike to school, but 40% of parents listed the lack of sidewalks and crosswalks as a barrier to active transportation.	**2.** In places where new walking and biking infrastructure (sidewalks, trails, other) are created or where existing infrastructure is improved, ensure there is a well-connected system so that students will not need to use potentially dangerous alternative routes
Having an adult present either in the form of a walking school bus leader or crossing guard would ease parental concerns	**I)** In Columbia, MO the walking school bus grew from 30 students and a few volunteers to 400 students from 14 schools that were led by 120 trained volunteers. It was the most successful program of their Active Living by Design project. The sustained success of the program was due to the development of a school-based coordinator that organized the walking school bus program. This walking school bus program increased physical activity of students that were driven to school by using a remote drop-off for parents from which the students walked 15 minutes. **II)** 58% of non-focus school parents and 54% of focus school parents in Columbus cited safety at intersections and crossings as a barrier to letting their children walk or bike to school. "	**3.** Fund a walking school bus coordinator. This position could either be part of the SRTS coordinator's job or rest within a different person's job responsibilities. **4.** The volunteer base to lead WSB must be maintained. A WSB coordinator is the best person to do this. **5.** Increase funding for Encouragement and Education in order to support a full-time SRTS coordinator staff person to implement the non-infrastructure countermeasures. Increased funding could be from ODOT; other SRTS Steering Committee member organizations could co-fund the position; or the SRTS Steering Committee could work together to find grant sources. **6.** The SRTS Coordinator should work closely with the Bicycle/Pedestrian Coordinator for the City of Columbus in order to connect and coordinate SRTS efforts with those made in the greater community. If there is not a Bicycle/Pedestrian Coordinator for the City of Columbus that position should be created. "


TRAFFIC
SAFETY

TRAFFIC SAFETY

EXISTING CONDITIONS

Rates of Crashes, Injury, and Fatality
Crashes between vehicles and pedestrians occur in Columbus with a regularity that is common in an urban environment. This occurs with more regularity in the inner, urban core of the city than it does outside of it. Vehicle crashes with bicyclists are less common, but are also prevalent in Columbus.

These types of crashes often occur near school buildings and sometimes involve youth pedestrians and bicyclists. According to ODOT, from 2011 – 2013 in Columbus, there were 1,423 pedestrian/vehicle crashes within 2 miles of a public elementary or middle school in the Columbus City School District.[103] This results in an average of 15 crashes per school area. When looking specifically at the 15 Focus Schools in this HIA, the incidence rate is even higher – with an average of 70 crashes per school area.

Table 3. Number of and Average Number of Crashes within 2 miles of all Schools and Focus Schools in Columbus OH, 2011 - 2013

	# of crashes with ped/bike crashes within 2 miles	Average number of crashes per school area
Non-Focus in Columbus	1,424	15
Focus Schools in Columbus	1,048	70

Source: The Ohio Department of Transportation: Safe Routes to School Crash Statistics.

Looking at the crash data we see that 58% of crashes that occurred within 2 miles of a school took place within ½ mile of a school. Considering the rate of crashes per 1,000 students enables us to see how much higher the rate is among the Focus Schools. In Focus Schools there were 43 crashes per 1000 students whereas in Non-Focus Schools there were 18 crashes per 1000 students. The crash rate in Focus Schools is over twice that of Non-Focus Schools. Looking at pedestrian crashes specifically we see that the Focus School rate is 31 per 1000 students whereas in the Non-Focus Schools it is 12 per 1000 students, again the rate is over twice as high in the Focus Schools. Looking at bicycle crashes specifically we see that the Focus School crash rate is 15 per 1000 students whereas in the Non-Focus Schools it is 6 per 1000 students.

Turning our attention to the injury and fatality rates; the Focus School injury rate is 41 per 1000 students and the fatality rate is 0.5 per 1000 students compared to the Non-Focus School with an injury rate of 16 per 1000 students and a fatality rate of 0.3 per 1000 students. All of these rates paint a clear picture that the Focus Schools have much higher rates of crashes, injuries, and deaths than the Non-Focus Schools. This strengthens the main thrust of the HIA; that SRTS efforts should be prioritized in these schools.

Table 4. Crashes, Injuries, and Fatalities within a ½ mile of Focus Schools and Non-Focus Schools in Columbus OH, 2011 – 2013.

	Focus School (n=15 schools; 6,062 students)	Rate (per 1000 students)	Non-Focus Schools (n=79 schools; 30,760 students	Rate (per 1000 students)
# of crashes	261	43	541	18
% of overall crashes within 2 mi of all CCS K-8 schools	20%		38%	
# of auto/pedestrian crashes	190	31	374	12
# of auto/bicycle crashes	92	15	173	6
# of injuries	251	41	495	16
# of fatalities	3	0.5	10	0.3

Based on previous research, the neighborhood profile and population demographics of each school area, the Focus School students have an increased risk of being involved in a crash with a motor vehicle verses Non-Focus School students. Each of the social determinants of health indicators that were used in the Level 1 analysis to evaluate each school community have been linked to increased rates of pedestrian injury and fatality, particularly in children. Of note, Weinland Park Elementary is directly surrounded by two high-volume one-way arterial roadways, and has a corresponding high crash rate.

Table 5. Number of Pedestrian and Bicycle Crashes with Automobiles near Focus Schools and All Schools in Columbus, 2011 – 2013.

School Name	# of Ped/Bike Crashes within ½ mile of focus schools	Rate (per 1000 students)
Avondale	26	70
Champion	13	49
Eakin	9	26
East Columbus	2	4
Fairmoor	0	0
Hamilton	23	49
Highland	25	81
Lincoln Park	20	54
Livingston	22	46
Ohio	20	59
Starling	26	42
Sullivant	2	7
Trevitt	6	18
Weinland Park	53	135
Windsor	14	27
All Focus Schools		43
Total	261	

The schools with the top five crash rates (Weinland Park, Highland, Avondale, Ohio, and Lincoln Park) all have the highest density of crashes occurring on a major thoroughfare or multiple thoroughfares. In the case of Weinland Park, which has the highest crash rate, the greatest density of crashes along a single corridor occurred on North High Street with 27

total 2011-2013 crashes involving; 17 pedestrians; 14 bicyclists; resulting in 20 injuries and no fatalities. The next highest density of crashes along a single corridor near Weinland Park were on Summit and North 4th Streets with 13 total crashes involving; 8 pedestrians; 5 bicyclists; resulting in 12 injuries, and 1 fatality.

The lower speed limit on North High Street (25mph) compared to Summit and North 4th Street (35mph) may be a deciding factor as to why the percentage of crashes resulting in injuries is lower. Looking at the respective corridors, 74% of crashes along North High Street resulted in an injury or death whereas 100% of crashes along Summit and North 4th, where the speed limit is 10mph higher, resulted in injury or death. There is research to back this conclusion. If a pedestrian is hit by a vehicle traveling at 40 mph they have a 20% survival rate, the survival rate increases to 60% when the vehicle is traveling at 30 mph, and increases again to 95% when the vehicle is traveling at 20 mph. [104] Another study found that a pedestrian has an 85% chance of death or incapacitating injury when being hit by a vehicle traveling 40mph. [105] The chance of death or incapacitating injury lowers to 5% when the speed of the vehicle is lowered to 20mph. The first hand data and the previous research make the case for lower speed limits and/or increased enforcement, traffic calming devices, and road diets to lower traffic speeds. This is especially important on roadways within a half mile of schools where students are more likely to engage in active transportation.

Traffic Volume and Speed

Posted speeds near CCS schools are 25, 35, or 45 miles per hour, and during schools hours Ohio law states that speeds are lowered in school zones to 20 miles per hour.[106]

Traffic volume near the Focus Schools is important when considering priority sites for SRTS engineering infrastructure, education about traffic safety, and enforcement programming. We collected Average Annual Daily Traffic (AADT) volumes for corridors and segments near the priority schools.

An AADT of 20,000-25,000 (average vehicles per day) is considered toward the upper limit for roads that are classified as urban minor arterial roadways, and 10,000-15,000 AADT is the upper limit for urban major collector roadways. [107] North 4th Street and Summit Street which directly border Weinland Park could be considered either major collector streets or minor arterials. North 4th St has an AADT close to 12,000 which highlights the intense volume for that street. In Table 6, it is clear that in close proximity to Highland, Starling, Avondale, Livingston (although this traffic count is quite old for this location), and Weinland Park schools there is high traffic volume on a roadway located within two blocks of the school.

Table 6. Average Annual Daily Traffic Counts for Street Segments Near Focus Schools

School and Road	AADT	Year of data
Eakin		
Sullivant Ave btw Kingsford & Wedgewood Ave	19,536	1999
Highland		
Highland Ave btw West Broad & Floral St**	1,324	2013
West Broad St btw South Highland & Wheatland Ave**	**27,680**	2003
West Broad St btw South Highland & Clarendon Ave**	**21,173**	2013
Starling		
Central Ave South of West Broad	12,050	2011

North of Town St**	**13,202**	2011
South of Town St**	**13,150**	2011
Avondale		
West Town St btw Hawkes & Avondale Ave**	3,215	2012
Avondale Ave btw West State & West Broad St**	1,003	1996
West Broad St btw Hawkes & Avondale Ave**	**17,053**	2013
Sullivant		
Harmon Ave btw Greenlawn & Wharton Ave	8,728	2013
West Mound St btw Mt Calvary & South Souder St	8,409	2010
Lincoln		
Parsons Ave btw East Morrill & East Welch St	16,408	2006
East Markison Ave btw South 19th & South 18th Ave**	208	2001
Livingston		
Livingston Ave btw May Alley & Heyl Ave**	**13,005**	1995
Livingston Ave btw South 17th & Ann Ave	14240	2010
Ohio		
South Ohio Ave btw Mooberry & East Fulton St	4,887	2013
Cole St btw South Ohio & Champion Ave	1,439	2013
Trevitt*		
Champion*		
East Columbus		
East 5th Ave btw Rarig & North Gould Ave	23,852	2014
Stelzer Rd btw East 5th & East 6th Ave	28,078	1998
Fairmoor		
South James Rd btw East Main & Bexley Park St	18,904	1994
East Main St btw Elizabeth & South Hampton Ave	24,546	2008
Windsor		
Cleveland Ave btw East 12th & Windsor Ave	18,360	2004
Cleveland Ave btw East 11th & Chittenden Ave	16,588	2003
Hamilton		
Hamilton Ave btw East 24th & East 25th Ave**	5,239	2007
East Hudson St btw Hamilton & Lexington Ave	11,066	2014
Weinland Park		
North 4th St South of East 7th Ave**	**11,592**	2010
North of East 7th Ave	11,995	2010
East 7th btw North 4th & Summit St**	2,404	2010
Summit St btw East 5th & East 6th Ave	9,777	2011
*no measurements close and/or no compelling data		
**measurements within 2 blocks of school		

Data source: MORPC Traffic Count Database System. http://morpc.ms2soft.com/tcds/tsearch.asp?loc=Morpc&mod= .Retrieved on 10.22.14

Parent and School Administrator Concerns About Traffic Safety
Parents of CCS students are highly concerned about traffic safety, according to both the Parent Survey and the Principal Survey.

The Parent Survey results showed that, the 4th, 5th, and 6th most common district-wide responses to the question about issues regarding why parents would not allow their children to walk or bike to and from school had to do with traffic safety: "Safety of intersections and crossings" (58%); "speed of traffic along route" (57%); and "amount of traffic along route" (56%). The only responses that garnered a higher percentage of parental concern were distance, violence or crime, and weather. Highlighted below are a few responses from parents concerning traffic safety:

- "There is way too much traffic for walkers and bikers to be safe."
- "Traffic on the main road that the school is on is horrific! I think if the traffic was better, more parents would allow their children to walk. The traffic pattern needs to change."
- "There is much congestion and walking to school is advisable only with an adult in my estimation. Parking is minimal and often dangerous."

Analyzing the Parent Surveys from only the Focus Schools paints a slightly different picture. The second, third, and sixth most common responses had to do with traffic safety: "speed of traffic along route" (55%), "safety of intersections and crossings" (47%), and "amount of traffic along route" (56%). By far, violence or crime was the top answer with 74% of parents responding that this was the main reason they would not let their child walk or bike to school. The responses below give an example of the experiences of Focus School parents:

- "Last year my daughter got clipped by a truck because there is no sidewalk."
- "Slow down! I just wish there were more cops clocking people on speed."
- "My child must cross E. Main Street to walk to/from school. There is only one stoplight with a crosswalk in the area. Many children are crossing in the middle of the busy street. This is a highly dangerous situation."

Principals were also concerned about traffic safety. Table 7 shows the top five concerns that principals reported on the principal survey, disaggregated by; All Schools, Focus Schools, and Non-Focus Schools.

Table 7. Top 5 Barriers to Walking and Bicycling to School as Reported by Principals

	Total	Focus Schools	Non-Focus Schools
Number of Responses	**48**	**9**	**39**
Barrier 1	Safety at intersections and crossings.	Concern about violence or crime.	Distance (i.e. Most students live too far away from school to walk or bike).
Barrier 2	Distance (i.e. Most students live too far away from school to walk or bike).	Safety at intersections and crossings.	Safety at intersections and crossings.
Barrier 3	Speed of traffic along key student walking and bicycling routes.	Convenience (i.e. Parents find it more convenient to drive their children to and from school).	Speed of traffic along key student walking and bicycling routes.
Barrier 4	Convenience (i.e. Parents find it more convenient to drive their children to and from school).	Lack of adult supervision.	Convenience (i.e. Parents find it more convenient to drive their children to and from school).
Barrier 5	Volume of traffic along key student walking and bicycling routes.	Distance (i.e. Most students live too far away from school to walk or bike).	Volume of traffic along key student walking and bicycling routes.

Levels of Encouragement, Education, or Enforcement Activities to Support Traffic Safety
The Tables below illustrate principals' responses to the types of education, encouragement, and enforcement programming that exists at their schools. Conversely, if programming doesn't exist, the tables show how many schools are interested in those types of programming. The tables are broken down between All Schools, Focus Schools, and Non-Focus Schools.

Additionally, the HIA Core Team compiled programming that has taken place historically or is currently in place. This compilation is less detailed as most of these activities have taken place at one time or another, but are not ongoing educational or encouragement programs. All enforcement activities are ongoing.

Table 8. Education

	Total		Focus Schools		Non-Focus Schools	
	57		10		47	
Education	**Is implementing**	**Would be interested**	**Is implementing**	**Would be interested**	**Is implementing**	**Would be interested**
Pedestrian safety education	10	32	3	6	7	26
Bicycle safety education	4	29	1	4	3	25

In-Class Presentations
These have included interactive activities that address walking and biking safety, presentations, videos, contests, workbooks, or lesson guides like the "Every Move You Make" walking and bicycling traffic safety education created by ODOT. "Every Move You Make" aligns with Ohio Academic Standards, which can increase uptake and interest by school administration and staff.

Girls in Gear
Girls in Gear began in February of 2013. It is a girls-specific bicycle youth empowerment program where girls aged 9-14 participate in an eight-week program focusing on bicycle safety/road riding, bicycle mechanics, nutrition education, urban design and public speaking. Participating girls receive; a bicycle, a set of lights, a helmet, a lock and get to meet a local community leader upon completion. To date, 'Girls in Gear' has gone through three program cycles, and graduated 21 'change-agents' with a completion rate of over 90%.

Neighborhood Pride
Neighborhood Pride is led by the City of Columbus. Several city and county departments collaborate to engage elementary school students with general safety and active living information. This program includes bicycle safety education about traffic signage recognition, bicycle helmet fit, bicycle fit, hand signaling, and other basic bicycle safety skills. Neighborhood Pride typically takes place at four elementary schools in four neighborhoods in Columbus. The neighborhoods change annually for each cycle of the program.

Bicycle Safety Presentations
These take place at summer youth programming locations such as the Clintonville CRC Summer Kids Club and east side childcare centers. The presentations engage students with a variety of safety information and demonstrations.

	Total		Focus Schools		Non-Focus Schools	
	57		10		47	
Encouragement	Is implementing	Would be interested	Is implementing	Would be interested	Is implementing	Would be interested
International Walk to School Day	2	21	0	2	2	19
Walking school buses (adult supervised groups of children who regularly walk to/from school together)	0	22	0	4	0	18
Bicycle trains (adult supervised groups of children who regularly bicycle to/from school together)	0	18	0	2	0	16

Consider Biking
Consider Biking is a local bicycle advocacy organization that has delivered programming in several CCS schools, including Valleyview, Westmoor, Dana, Starling, Avondale, Sullivant, and Lincoln Park.

Bicycle Rodeos
Bicycle rodeos engage students with maneuverability, stopping and turning hand signals, along with clothing visibility so that students can better avoid accidents, ride in a safe and legal manner, while gaining confidence in their riding abilities. The most recent bicycle rodeo was held at Clinton Elementary in the spring of 2014. Students were taught about bicycle safety by riding through a maneuverability course practicing the skills outlined above.

Yay Bikes! Earn a Bike program
Summer programming efforts outside of the school setting include efforts such as the Earn a Bike program. Yay Bikes! partnered with a west-side bicycle co-op (Franklinton Cycleworks), located within ¼ mile from Avondale Elementary. This program is composed of educational on-street rides that teach riding techniques, safety, and map reading. Basic mechanical training sessions teach students not only mechanical skills, but also the importance of proper bicycle maintenance to avoid crashes.

Walk and Bike to School Days
This is an international event that occurs twice a year and some local schools participate. Clinton Elementary has participated with regularity in recent years, and the only other schools that have participated in CCS during the time the LDSTP was being completed are: Avondale Elementary, Ohio Ave Elementary, Valleyview Elementary and Westmoor Middle. The purpose of these events is to galvanize visibility for active transportation to school and to encourage more students and parents to walk and bike to school not only on the day of the event, but throughout the year.

Educational/Encouragement Rides
These rides involve parents in riding with their children while using proper hand signals, traffic lane positioning, safe street crossing, and teaching alternative routes to arterial roadways so more families feel uncomfortable riding on urban roadways.

	Total		Focus Schools		Non-Focus Schools	
	57		10		47	
Enforcement	Is implementing	Would be interested	Is implementing	Would be interested	Is implementing	Would be interested
Speed reduction campaign	3	28	0	6	3	22
No phone zone campaign (to discourage cell phone use while driving)	0	22	0	2	0	20

Crossing Guards
The CCS Transportation Department provides a stipend, equipment, and training for 1 adult crossing guard at every school. ODOT and the American Automobile Association of Central Ohio also provide crossing guard training and materials such as belts, flags, and rain jackets. All but one of the Focus Schools (Champion Middle School) has an adult crossing guard and 7 of the 15 Focus Schools have student safety patrols.

Flashing Beacons
Flashing beacons are stationed at the beginning of the school zone for each school. These alert drivers that they must obey the 20mph speed limit while the sign is flashing. Some beacons are manually operated with a switch or a key by school staff and others are automatically activated by a timer. According to the School Zone Coordinator for the City of Columbus, Tamara Peters, all CCS schools will have automatically activated beacons in the coming years in order to ensure that they are activated at the proper time every school day.

Speed Wagons
Speed wagons can be placed near or in a school zone by the Columbus Division of Police or the Department of Public Service by request. Weinland Park Elementary, bordered on the east and west by two 1-way arterial roadways that are also state routes, often has a speed wagon placed within the school zone to calm traffic speeds. Motorcycle officers are also stationed in the zone periodically to ease traffic speeds that often rise above 35 mph (the posted speed limit during non-school hours).

Police Officers Placement
There are 2 police officers for the 94 schools stationed throughout CCS to enforce traffic speeds and observe any other illegal activities in and around schools. This effort is sustained by federal funding in coordination with the Columbus Division of Police.

LITERATURE REVIEW

This HIA considered how the equity indicators identified in the Level 1 analysis impact pedestrian and bicycle crashes with motor vehicles.

DEMOGRAPHICS

Income and Poverty
The strongest single factor correlated to increased rates of injury among youth pedestrians is the relative income of a child's family, and whether the child lives in poverty. Research has shown repeatedly that as the income level of a family or neighborhood decreases, the rates of pedestrian injury and fatality increase.[108] [109] [110] [111] [112] [113] [114] [115] [116] [117] [118] [119] [120] [121] [122] [123] [124] Regardless of the income metrics used or the country in which the study was conducted, the poorer the family or community, the higher the risk that a child is going to be stuck by a motor vehicle while walking or riding a bike.

The relationship between income and injury is a linear one, with injury rates increasing as income decreases. However, several studies have shown that the poorest of the poor experience significantly increased injury rates when compared to neighborhoods with even slightly higher incomes. When studies categorized communities by income, the poorest subset regularly displayed injury rates that were exponentially higher than the second poorest group. A 1992 study looking at youth pedestrian rates by income quintile in Montreal and Calgary found that injury rates in the poorest neighborhoods were about six times as great as those in the most affluent neighborhoods.[125] The rates gradually increased as neighborhood income decreased, except in the poorest quintile, where rates were significantly higher than the second poorest quintile (63% higher in Montreal and 79% higher in Calgary).

All of the Focus Schools are located in low-income Columbus neighborhoods. However, even within the Focus School communities there is a broad range of household income, with some schools located in the most impoverished neighborhoods in the city. Sullivant, Trevitt, Lincoln Park, Highland, and Windsor STEM Elementary schools are found in census tracts containing some of the highest percentage of people living below the poverty level

in Columbus. Research suggests that students living in these areas are at an exceptionally increased risk of being struck by a vehicle when walking or biking in their neighborhoods, particularly when travelling to and from school.

Because the social determinants of health such as income, education level, and race are often highly intertwined and correlated with each other, it is often difficult for researchers to separate the effects of each on pedestrian injury rates. Poverty appears to be such a strong predictor of increased injury risk it can mask the influence of other factors, even when it is controlled for in analysis. Given this, there still appears to be high risk associated with other determinants such as; race, ethnicity, education, crowding, housing, and single parenthood.

Race and Ethnicity

There are significant disparities in youth pedestrian injury rates between White and Non-White communities. Multiple studies have highlighted that geographic areas that are predominately Non-White, particularly Black populated neighborhoods, experience pedestrian injury rates at much higher levels than White populated areas. This disparity also appears when researchers look at the race of individual children involved in a collision with a vehicle.[126] [127] [128] [129] [130] [131] [132] [133] The census tracts that include Windsor STEM and Trevitt Elementary schools have two of the highest percentages of Non-White residents in Columbus at 98% and 93% respectfully. This data suggests that residents of those neighborhoods could be at an increased risk of pedestrian injury.

A comprehensive study conducted on child pedestrian injury data from Hartford, Connecticut found that census tracts with a high frequency of crashes were 85% Non-White, while low frequency census tracts were only 39% Non-White.[134] In 1990, Rivara estimated the rate of pedestrian fatalities for Non-White children to be 1.5 times higher than the rate for White children.[135] A study by Agran et al. in 1996 estimated the pedestrian injury rate for Latino children to be more than twice the rate for Non-Hispanic White children.[136]

Black pedestrians are not only involved in more crashes with vehicles as pedestrians, but they also experience more serious injury and higher fatality rates than Whites. According to the National Center for Injury Prevention and Control, the pedestrian fatality rate for African Americans was nearly twice that for Whites.[137] Even though African Americans make up only 12% of the total US population, they represent 20% of pedestrian deaths.[138]

Education

The education levels of parents and caregivers are also correlated to the risk of pedestrian injury in their children, as geographic areas with lower parental education levels display higher rates of injury for both youth walkers and bikers. The risk for injury appears to be significantly higher for children of parents with less than a high school diploma.[139] [140] [141] [142] All of the Focus Schools are located in neighborhoods with relatively low levels of parental education. In particular, the census tract where Sullivant Elementary is located has the highest percentage of adults with less than a 12th grade education (34%) in Columbus.

A case-control study from Montreal indicated that a high level of parents' education was strongly related to a lower risk of injury.[143] When looking at non-fatal child bicycle and pedestrian injuries, they found a two-fold excess risk for low versus high maternal education.

Housing and Crowding

There are multiple housing related indicators that have been studied and strong relationships exist between these metrics and pedestrian injury rates among youth.[144] [145] [146] [147] [148] [149] [150] [151] [152] [153] Higher population density (especially population densities of children) and a larger number of housing units are positively associated with a higher number of crashes, as well as more severe crashes between vehicles and pedestrians. Additionally, household sizes and the number of family members living per room are typically larger for areas with more crashes. Pedestrian accident rates are also highly correlated to the percentage of government subsidized housing, and the age of housing stock. Residents of older buildings have an increased injury risk. Finally, children living in multifamily dwellings have a risk of injury that is up to 5.5 times greater than children living in single family homes.[154]

A research study conducted on childhood pedestrian injury data in Memphis, TN examined multiple factors related to socioeconomic and housing conditions and found a number of significant associations.[155] In fact, the single variable of crowded housing per acre best predicted the number of injuries per acre in the analysis. There were more than three times as many households with more than one person per room in census tracts with childhood pedestrian injuries than in those without recorded injuries. Additionally, the number of housing units that were crowded was three times higher per acre in the tracts with childhood pedestrian injuries. In Columbus, the neighborhoods around Highland and Sullivant Elementary Schools have some of the most crowded housing in the city.

Single Parent

Children that live in households headed by a single parent, particularly if that parent is a woman, are at an increased risk of pedestrian injury.[156] [157] [158] [159] [160] [161] [162] [163] [164] Whereas this variable is often correlated with the other demographic characteristics discussed here, living in a single parent household alone appears to be enough to increase the risk of injury for youth pedestrians.

When looking at National Health Interview Survey data, a 1997 study found that children in a household with a single adult still have an increased injury risk of 40% (after adjustment for access to care and all other factors).[165] Another study indicated that 50% more children were living in female-headed households in census tracts with reported injuries versus those without injuries.[166] A New Zealand study found that children of single parents had a risk of injury over 1.5 times higher that of children without single parents.[167] Ohio, Fairmoor, and Champion schools are located in neighborhoods with some of the highest rates of single parent families in Columbus.

Socioeconomic Index

Whereas looking at all of these aforementioned indicators in isolation is an important step in understanding the factors that relate to childhood pedestrian and bicycling injuries, the truth is that they are all greatly interrelated. All of these neighborhood, family and demographic characteristics combine to create a complex community profile that has been associated with pedestrian injury risk. In the Level 1 analysis this report addressed that association with the incorporation of the socioeconomic status index methodology. Several traffic injury studies have attempted to create indices which include multiple, separate social determinants of health. By including various elements into these different indices, each research study attempted to create a model that most accurately identified the factors that lead to increased pedestrian injury and fatality rates among children.

One study of note conducted in Northern Ireland in 2011, calculated a Multiple Deprivation Measure for all areas of the country based on seven different factors, including many used for the socioeconomic status index in our assessment. Researchers stratified these areas into ten deciles and found that children in the poorest, least educated areas were 4.8 times more likely to be injured as a child pedestrian than a child residing in the most affluent areas. Furthermore, the children in the areas of the country with lowest socioeconomic status had injury rates significantly higher than the children in the second poorest decile (1.82 vs. 1.10).

TRAFFIC

Traffic Speeds and Volumes Determine Physical Activity Choices
Trapp et al discovered that boys were almost three and a half times more likely to walk to school in the presence of low traffic volumes, and less than half as likely to walk if they had to cross a busy roadway.[168] A study of African American public housing residents showed that lower speed limits were associated with increases in physical activity.[169] When a neighborhood has lower traffic speeds and volumes, levels of walking and biking increase and when traffic volumes and speeds rise, levels of walking and biking fall.[170] Decreasing traffic speeds increases the amount of time drivers have to react to road hazards, potentially averting crashes and making crashes that do happen less severe.[171] Consistent evidence over the past century confirms that lowering traffic speeds decreases the frequency of crashes as well as rates of fatalities and injuries.[172] [173] Studies show that decreasing traffic speeds by 5 mph results in an actual speed decline of 1.8 mph. This has been modeled and predicted to reduce fatalities, injuries, and crashes by a recent HIA.[174] [175]

Traffic Speed and Enforcement Impacts Crashes, Injuries, and Fatalities
There is ample evidence that drivers respond to perceived enforcement by adjusting their behavior, most notably by reducing their speed. In one study, automated enforcement, such as traffic cameras, yielded a 17% reduction in crashes that resulted in injuries.[176] In another study, hand-held laser operation was associated with reductions in crash frequency, but not severity. The visible operation of hand-held radars was reported by 63% participants who were driving through the school zone as being most the most effective speed enforcement method. Fixed cameras were the second most effective method as reported by 58% of participants. The study also categorized enforcement methods as overt or covert, and stationary or mobile. It was found that stationary/overt speed enforcement methods were associated with a significantly longer duration of compliance than covert operations. In terms of police presence, marked patrol vehicles on the side of the road were reported by 56% of participants as being effective to slow traffic speeds in school zones.[177]

Other research has found that automated speed enforcement, such as speed cameras, had marked effects on vehicular speeds in school zones. The traffic that exceeded the speed limit by more than 10 miles per hour was reduced by about 66% when automated speed enforcement was present. [178] Moreover, when automated speed enforcement was combined with a flashing beacon (which all CCS schools have) the effect on speed reduction was greatly increased.

Another study assessed the short-term and long-term effectiveness of speed-monitoring

displays in school zones. The short term results showed that average speed was reduced by about 18% when a driver recognized the presence of a speed-monitoring display. The long term results showed a 12% reduction in average speed.[179] Furthermore, the number of speeding vehicles was greatly reduced, and the 85th percentile speed (the standard for measuring speeding issues) decreased from 34 to 29 miles per hour in the short term, and from 34 to 28 miles per hour in the long term. The study concludes that the application of speed-monitoring displays in school zones produced a positive impact on the drivers' behaviors over both the short and long terms.

While these enforcement interventions have shown effectiveness, researchers of speeding behaviors in school zones in Sydney, Australia found that 23% of the distance travelled in school zones is above the speed limit. This is a rate higher than in non-school zones, on urban arterial and residential streets. They also found that a small minority of drivers exceeded the speed limit for as much as half the distance travelled. This indicates that despite efforts at reducing speeding in school zones, speeding remains very common. The study concluded that changing the road environment to force drivers to slow down may be more effective than an information campaign in changing drivers' speeding behavior.[180]

PREDICTIONS

How Will SRTS Interventions Impact Rates of Collisions, Injuries, and Fatalities in Our Target Populations?

Income, race, education, crowding and other factors have shown relationships to the rates of pedestrian injury in a community. SRTS interventions can address the high rates of vehicle-pedestrian crashes in these Columbus communities in order to increase the safety of children as they engage in active transportation to school. It is important to keep in mind that the desired effects of SRTS work may be different in school neighborhoods with higher proportions of families living in poverty, Non-White residents and Non-High School graduates.

Research clearly shows that Hispanic and African American children are more likely to use active transportation to school than White children, and that youth from low socioeconomic backgrounds are more likely to walk and bike to school than children from high socioeconomic backgrounds.[181] [182] [183] [184] [185] This suggests that SRTS interventions introduced to schools with higher populations of Non-White and Hispanic children, and schools in lower socioeconomic neighborhoods would have the potential to increase the safety of large numbers of walking and biking students.

Children also tend to walk more if their family does not own a car, if their parents have lower educational attainment, if they were born outside of the United States and if they were part of a large family. Again, there is a significant opportunity to reach a large population of walking and biking students by concentrating specific SRTS interventions on schools in neighborhoods that exhibit a profile that includes these factors.

ENGINEERING

PREDICTIONS	EVIDENCE	RECOMMENDATIONS
Concentrating traffic calming interventions in the low socioeconomic areas around the 15 Health Impact Assessment focus schools will result in a decreased injury rate among children that attend each school.	**I)** One city decided to focus their traffic calming interventions in low socioeconomic areas (4.8 more features than in high socioeconomic areas) and concentrate them in a smaller, more densely populated geographic area - the features in the high socioeconomic areas were 8 times further apart than in the low socioeconomic areas. The result of this strategy was a 2.14 decrease in child pedestrian injury rate over the study period. **II)** Children from neighborhoods with high traffic volumes are at increased risk. The risk of injury for children living in neighborhoods with the highest traffic volumes was 13 times higher that of children living in the least busy areas.	**1.** Place multiple Safe Routes to School engineering interventions around each of the focus schools in close proximity to each other, along pathways that children take to and from school. **3.** Infrastructure improvements should specifically address the main traffic issues of each school, with significant input from parents, principals and support staff. **7.** A minimum of 75% of infrastructure interventions built as part of Safe Routes to School funding should be allocated to the 15 focus schools identified in this report.
Limiting vehicle speeds to 20 miles per hour or less along major walking and biking routes around each focus school will increase the numbers of students actively commuting and decrease pedestrian death and serious injury rates.	**I)** In residential neighborhoods, an average vehicle speed of 30 mph, compared with 20 mph, was associated with more than a sevenfold greater risk of children being hospitalized for pedestrian injuries. **II)** If a pedestrian is hit by a vehicle that is traveling 20 mph, the pedestrian survival rate is 95 percent. This drops to 60 percent at 30 mph, and just 20 percent at 40 mph.	**2.** Traffic calming measures resulting in decreased vehicle speed should be prioritized around focus schools. **4.** A maximum speed of 20 miles per hour should be established along major walking and biking routes during before and after school hours.
Improving crossings and limiting the number of major road crossings at each focus school will decrease the risk of injury for walking and biking students, as will prioritizing traffic calming infrastructure in these areas.	**I)** Children in lower socioeconomic areas cross, on average, 50% more streets per day than children in higher socioeconomic areas and have a correspondingly higher injury rate.	**5.** Prioritize Safe Routes to School infrastructure interventions at major roads and intersections utilized by students walking and biking to and from school. **9.** The Columbus City School district should consider establishing boundaries of school attendance zones so that walking and biking students cross as few major roads as possible."
Developing affordable housing away from high-speed, high-volume streets, would result in a decrease in the childhood pedestrian injury rate. Additionally, prioritizing traffic calming infrastructure around areas of affordable housing would decrease injury rates.	**II)** More affordable housing often is located along high-speed, high-volume streets and these types of streets are associated with increased risk for pedestrian injuries.	**6.** Engineering interventions should be placed along priority corridors that link affordable housing developments and focus schools. **10.** Affordable housing developments that are located on high-speed, high-volume roadways should be required to provide pedestrian and bicycle access away from the high-speed, high-volume roadways.
Prioritizing infrastructure projects in communities with high proportions of Latino residents will decrease pedestrian injury rates among Latino children.	**III)** The rate of pedestrian injury for Latino children has been estimated to be as high as twice that of non-Latino White children.	**8.** Engineering interventions should be prioritized for focus schools with a significant population of Latino students, primarily on routes frequented by these children.

ENCOURAGEMENT

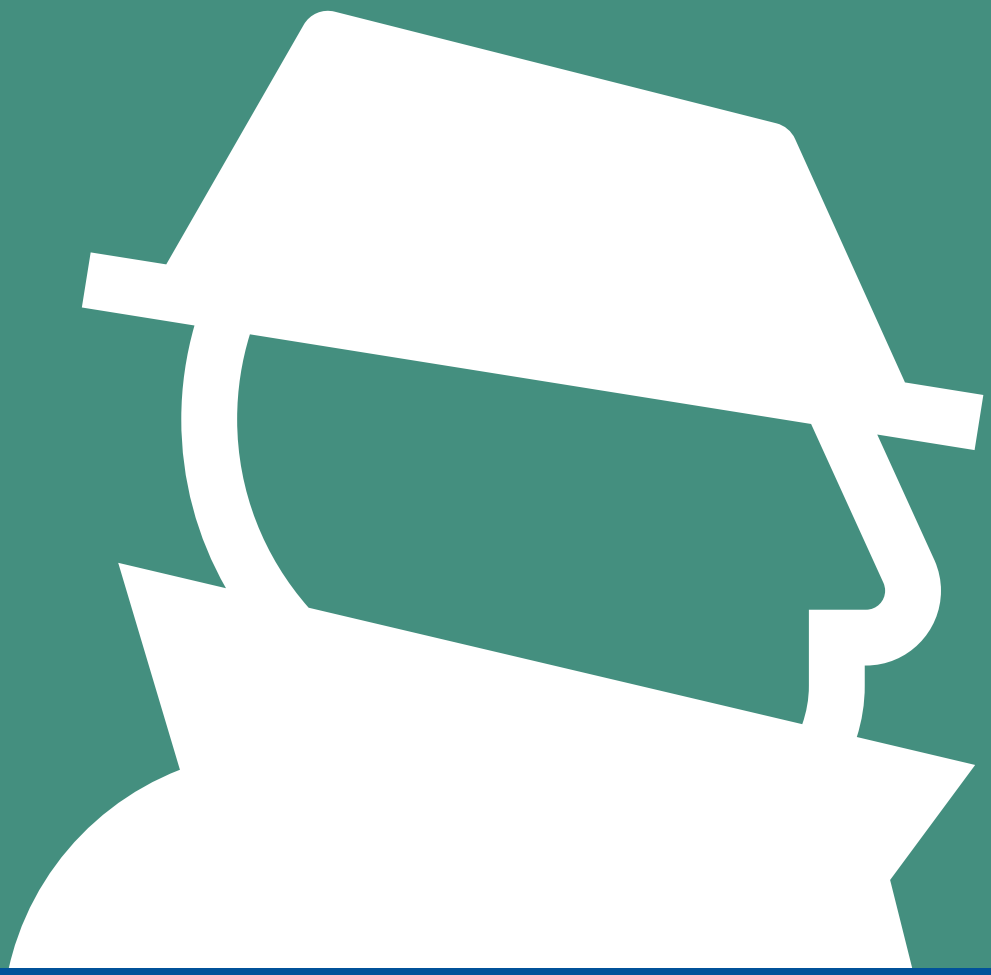
PREDICTIONS	EVIDENCE	RECOMMENDATIONS
Encouraging US born parents to allow their children to walk or bike to school would lead to an increased number of walking and biking students.	**I)** Being born in the United States decreased the likelihood of walking and biking to school, suggesting a social stigma against this form of transportation in addition to concerns around traffic safety among the US born population.	**1.** Develop encouragement programs targeted at US born families that highlight the benefits of walking and biking and how to actively commute safely.

EDUCATION

Delivering more comprehensive pedestrian education programming (that involves parents) will result in students that are safer walkers and bikers.	**I)** Many road safety educational programming provided to children has been shown to not be overly effective. Parental involvement in the education of their children has been found to be more successful, especially with regards to safety initiatives.	**1.** Develop and administer pedestrian education to students at all fifteen focus schools that involves parents and other best practices.
Education that meets the needs and schedule of parents that are hourly, unsalaried workers will result in better attendance and completion.	**II)** Injury rates are up to 30% higher among the children of "manual" or "unskilled" workers.	**2.** Develop educational sessions that are cognizant of the schedules and restrictions of hourly, unsalaried workers in the focus school neighborhoods. **3.** Provide educational activities at a variety of times to accommodate various parental working schedules.
Education that meets the needs and schedule of single parents will result in better attendance and completion.	**II)** Children in single parent families have a higher risk of pedestrian injury (up to 40% higher).	**4.** Develop educational sessions that are cognizant of the schedules and restrictions of single parents in the focus school neighborhoods.
Pedestrian education that is delivered at appropriate education levels will result in parents and children that walk more safely.	**IV)** Increased childhood pedestrian injury rates are associated with neighborhoods with lower parental education levels.	**5.** Develop and administer pedestrian education at the learning level of parents in the community around each of the focus schools.
Education that is developed specifically for the Latino community will result in greater comprehension and ultimately decreased childhood pedestrian injury rates among Latino students of focus schools.	**V)** There is a difference in pedestrian safety behaviors between Latino and non-Latino students.	**6.** Develop educational sessions that are cognizant of the language and cultural needs of the Latino communities in the focus school neighborhoods.
Comprehensive pedestrian education that is provided to middle school students will result in decreased rates of injury among that population.	**VI)** Middle school students are more often involved in traffic collisions than either elementary or high school students.	**7.** Develop education programs that are specifically targeted toward middle school students.

ENFORCEMENT

PREDICTIONS	EVIDENCE	RECOMMENDATIONS
Increased police patrols at each of the focus schools during dismissal will result in a decrease in childhood pedestrian injuries.	**I)** More school age pedestrians were killed in the afternoon than in the morning, with 41% of the fatalities taking place during the single hour between 3:00 PM and 4:00 PM.	**1.** Increase police patrols at the focus schools at the time that school is dismissed.
Enforcing vehicle speeds of 20 mph in Focus School zones during arrival and dismissal times will result in a decrease in fatalities and injuries in those areas.	**II)** Reducing speeds reduces number and severity of collisions.	**2.** Increase enforcement of 20 mph school zone speeds.



CRIME

CRIME AND PERCEPTION OF CRIME

EXISTING CONDITIONS

Rates of Crime: Police Runs
Columbus Public Health obtained police run data from the Columbus Division of Police to analyze the concentrations and occurrences of both violent and quality of life crimes. Data included all police runs from January 1, 2013 – August 31, 2014 that were a response to 911 calls (29%), non-emergency calls (56%), and when an officer was notified directly by a witness to a crime, or was a witness themselves (13%). Runs were classified as related to a potential violent crime or potential quality of life crime by using the Columbus Division of Police Official 10 Code, (see Tables 10 and 11 to see the types of crime we qualified as violent or quality of life).

The data points are *not* actual arrests or convictions. The literature shows that phone calls for service often under count the amount of crime that police officers encounter on while on patrol.[186] However, since this data set includes other actions that caused the police runs, this data set is likely more accurate than simply calls for service. Also note that a 1-mile radius around a school often includes other schools, leading to some of the runs being counted more than once. For example, Fairmoor and East Columbus are within one mile of each other. Runs that were made within the 1 mile radius of each school are counted twice (once for Fairmoor and once for East Columbus) in the total number of runs reported here.

Table 9. Police Runs Within a 1-mile Radius of Focus Schools, 2013 - 2014

Focus School	Total Police Runs	Police Runs – Potential Violent Crimes	% Potential Violent Crime Police Runs Out of All Police Runs for the Focus School	Police Runs – Potential Quality of Life (QoL) Crimes	% Potential QoL Police Runs Out of All Police Runs for the Focus School
Avondale	29,925	2,288	7.7%	12,260	41%
Champion	24,857	1,803	7.3%	8,830	36%
Eakin	11,631	900	7.7%	4,066	35%
East Columbus	7,726	601	7.8%	2,204	29%
Fairmoor	13,051	1,069	8.2%	4,528	35%
Hamilton	28,867	2,509	8.7%	9,988	35%
Highland	30,588	2,623	8.6%	11,198	37%
Lincoln Park	27,886	2,136	7.7%	10,585	38%
Livingston	36,795	2,874	7.8%	13,005	35%
Ohio Ave	39,593	3,078	7.8%	14,526	37%
Starling	30,441	2,455	8.1%	12,891	42%
Sulllivant	15,679	1,125	7.2%	5,500	35%
Trevitt	21,275	1,647	7.7%	6,907	32%

Windsor STEM	19,231	1,615	8.4%	6,275	33%
Weinland Park	31,245	2,070	6.7%	13,217	42%

Source: Columbus Division of Police. January 2013 through August of 2014.

There is no great difference between the Focus Schools in terms of the proportion of police runs that are made for potential violent crimes; between 7%-9% of police runs respond to potential violent crimes. However, between 29%-42% of police runs are for quality of life crimes. In terms of raw numbers there are notably more police runs within the 1-mile radius at Livingston and Ohio Ave.

Table 10. Potential Violent Crimes

OFFICIAL TEN CODE	DESCRIPTION
14	Cutting or Stabbing
26	Fight
27	Assault or Hospital Report
28	Homicide
33	Person with Gun
33A	Person with Knife
41	Robbery – Just Occurred
41A	Robbery Report
42	Robbery in Progress
42A	Robbery Alarm
43	Shooting
44	Sex Crime in Progress
44A	Sex Crime Report
48G	Suspected Threat Group Activity

Table 11. Potential Quality of Life Crimes

OFFICIAL TEN CODE	DESCRIPTION
16	Disturbance
16B	Disturbance / Mental
19	Intoxicated Person
22	Animal Complaint
29	Juvenile Complaint
35	D.U.I. Complaint
38	Property Destruction in Progress
38A	Property Destruction Report
39	Prowler
44B	Indecent Exposure
48	Suspicious Vehicle
48A	Suspicious Person
49	Vice Complaint
49A	Narcotics Complaint

Fifteen maps showing the concentration of police runs for violent and quality of life were created for each of the Focus Schools by the Kent State University Health and Hazards Lab using the Columbus Division of Police data cited above. A concentration of runs means that *50% or more of the runs related to **violence** were made from the area outlined in **red** on the map*, and *50% or more of the runs related to **quality of life** were made from the area outlined in **purple.***

In the two maps below we can see that in close proximity to Champion, which is located on the Near East Side of Columbus, the places where quality of life police runs originate from are very different from where the police runs for violent crimes originate from. However, in close proximity Eakin, which is located on the West Side of Columbus, the police runs come from the same exact area. To see the maps for all of the schools, see Appendix A that details a profile for each school.

Figure 5. Concentration of Police Runs within 1 mile of Eakin

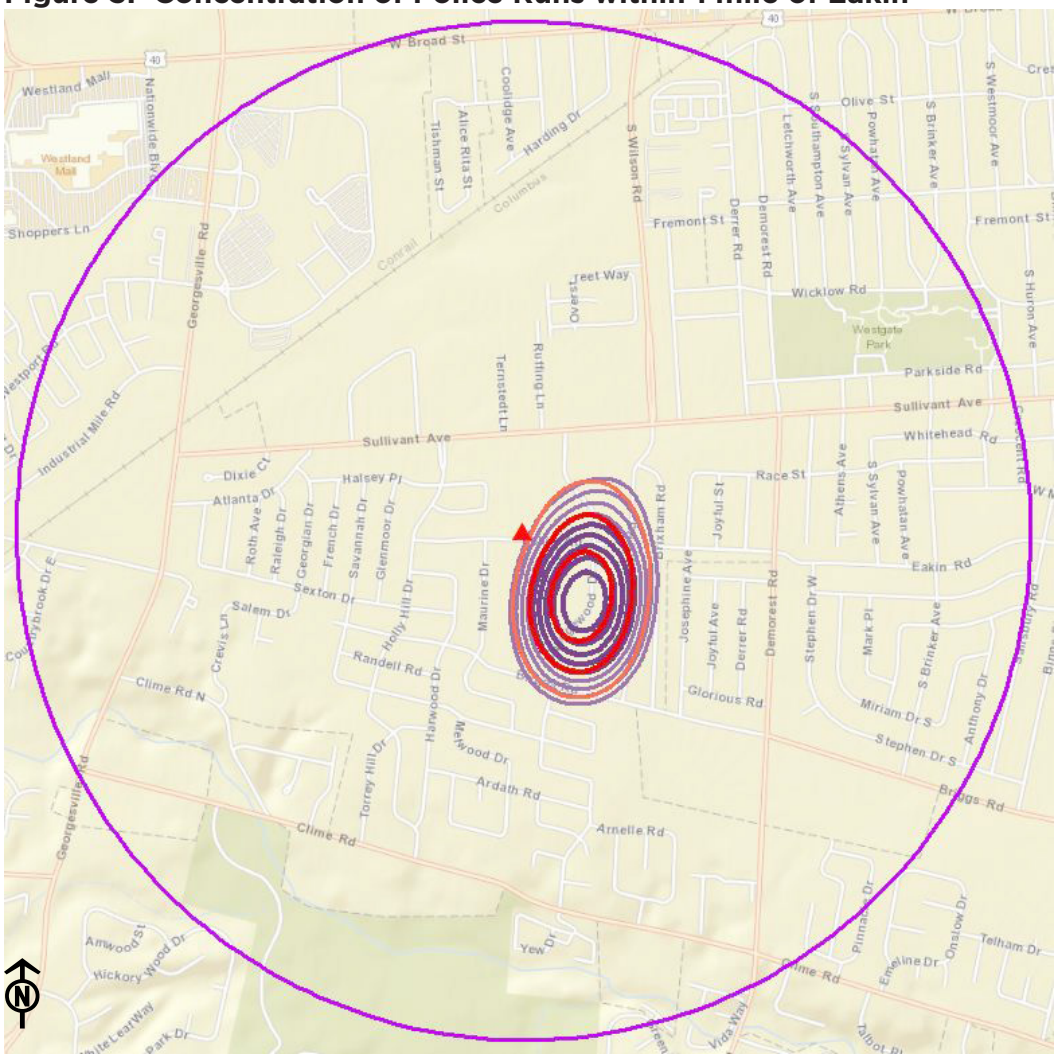
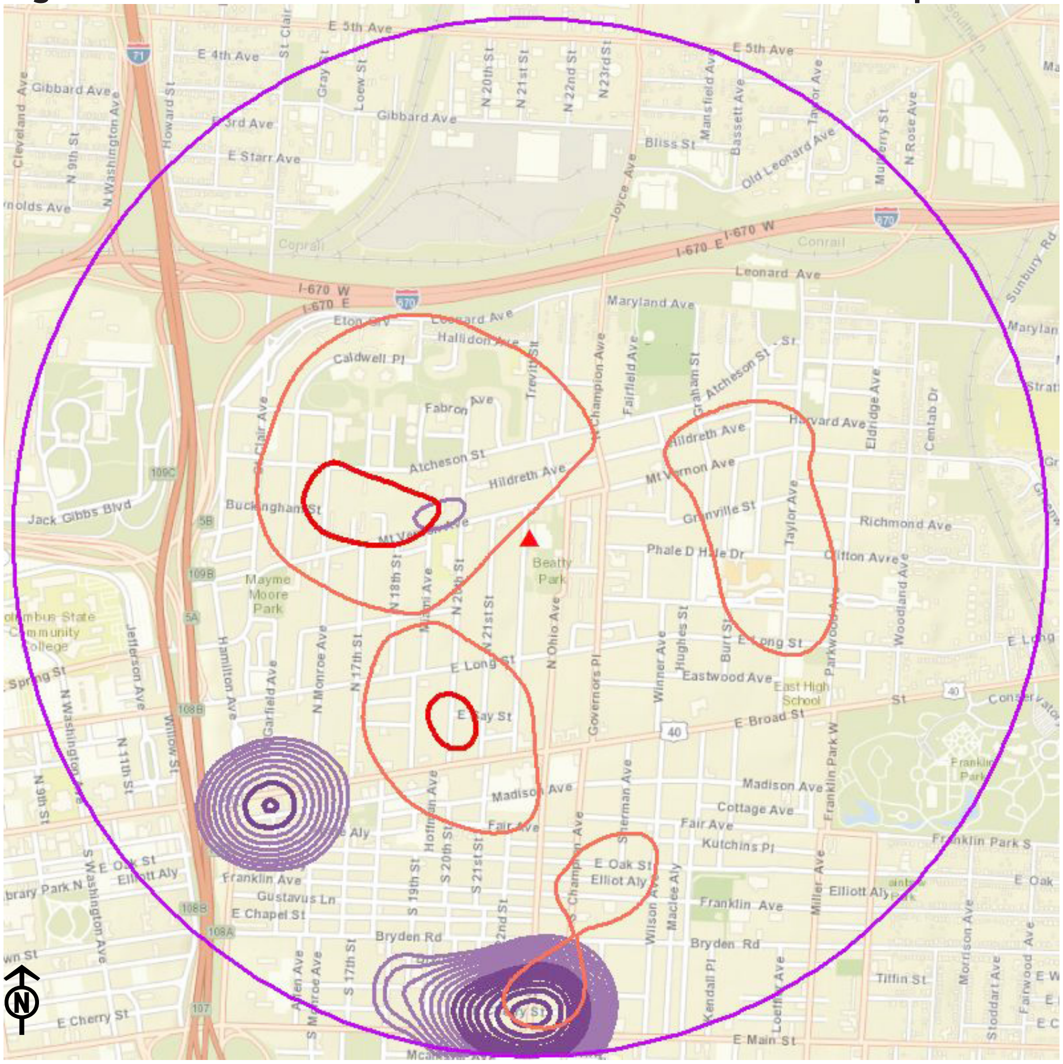


Figure 6. Concentration of Police Runs within 1 mile of Champion



Rates of Crime: Crime Incidence

In addition to data on police runs from the Columbus Division of Police, the Ohio Incidence Based Reporting System (OIBRS) provided data on crimes reported to them from the Columbus area for the period of May 2013 – June 2014. A total of 100,365 individual incidents were reported. Of these records, incidents that were either not located in the City of Columbus or had incomplete street address information were removed from the data set. This resulted in 72,001 crime incidents with complete street addresses located in the City of Columbus.

In Table 12, we report out only violent, quality of life, and total crime incidents and rates. Note that property and financial crimes are not disaggregated, and are only included in the totals. For example, in the one-mile buffer around Avondale; 31% of the crimes are categorized as violent; 5% are quality of life crimes; and 64% are either property, financial, or other crimes. Using rates per 1,000 people, there are 80 violent crimes per 1,000 people in Avondale and 260 total crimes per 1,000 people compared to Weinland Park, which has 19 violent crimes per 1,000 people and 120 total crimes per 1,000 people.

Comparing data from Table 12, below, we see that Avondale, Windsor, Starling and Hamilton have the highest violent, quality of life, and total crimes of all of the Focus Schools.

Table 12. Columbus Incidence and Rates of Violent, Quality of Life, and Total Crime

Focus Schools	Violent Crimes (1 mi radius) (% of all crimes)	Violent Crime Rate (per 1,000 pop)	QoL Crimes (1 mi radius) (% of all crimes)	QoL Crime Rate (per 1,000 pop)	Total Crimes (1 mi radius)	Population (1 mi radius)	Total Crime Rate (1 mi radius, per 1,000 pop)
Avondale	791 (31%)	80	123 (5%)	12	2,584	9,937	260
Champion	754 (28%)	51	120 (4%)	8	2,729	14,598	187
Eakin	490 (29%)	32	22 (1.3%)	1	1,707	15,414	111
East Columbus	286 25%)	32	30 (3%)	3	1,131	8,818	128
Fairmoor	355 (30%)	24	28 (2%)	2	1,185	14,945	79
Hamilton	1,165 (34%)	75	175 (5%)	11	3,430	15,615	220
Highland	1,158 (31%)	62	127 (3%)	7	3,837	18,587	206
Lincoln Park	871 (26%)	49	114 (3%)	6	3,405	17,828	191
Livingston	1,135 (28%)	51	108 (3%)	5	4,103	22,059	186
Ohio Ave	1,262 (30%)	62	126 (3%)	6	4,146	20,360	204
Starling	884 (31%)	74	133 (5%)	11	2,877	11,957	241
Sullivant	458 (31%)	68	35 (2%)	5	1,484	6,774	219
Trevitt	661 (30%)	57	104 (5%)	9	2,232	11,638	192
Weinland Park	641 (16%)	19	147 (4%)	4	3,946	33,014	120
Windsor STEM	768 (35%)	88	99 (5%)	11	2,184	8,737	250

Source: Ohio Incident Based Report System: http://ocjs.ohio.gov/crime_stats_reports.stm. Retrieved: December 2, 2014.

Figures 7 - 9 map this data for violent, quality of life and total crime rates in the Focus School neighborhoods.

Figure 7. Focus School Violent Crime Rate

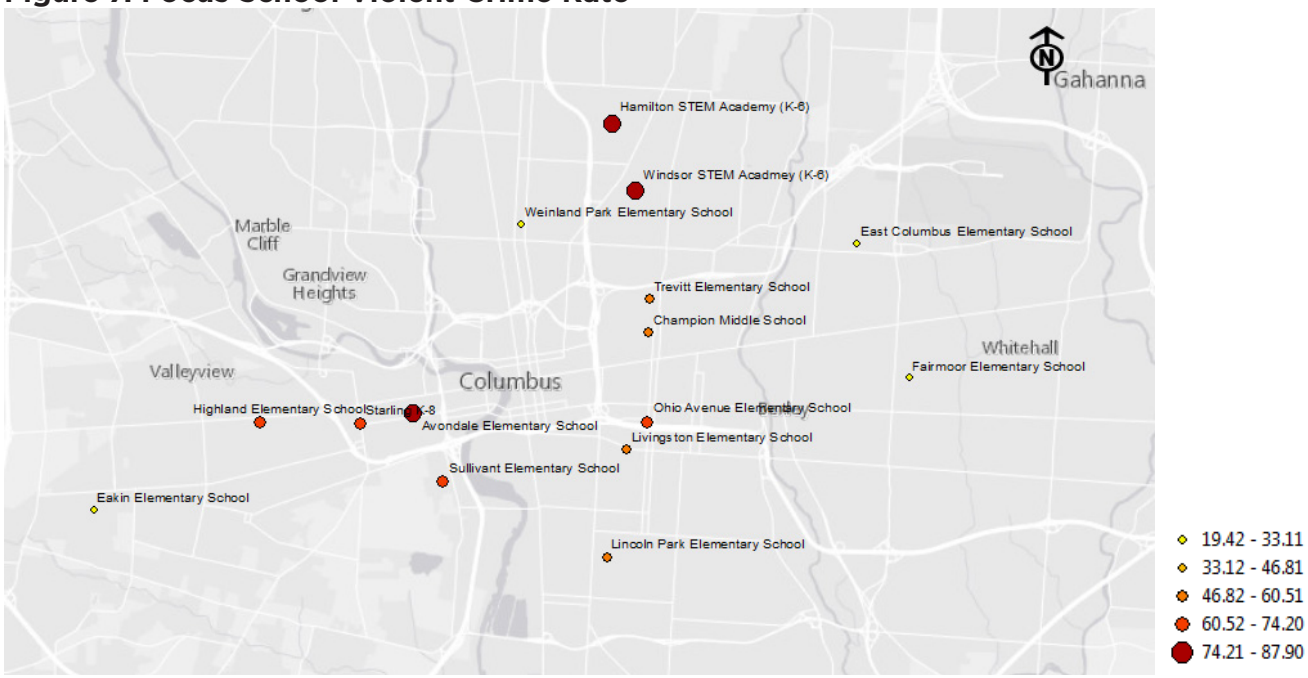


Figure 8. Focus School Quality of Life Crime Rate

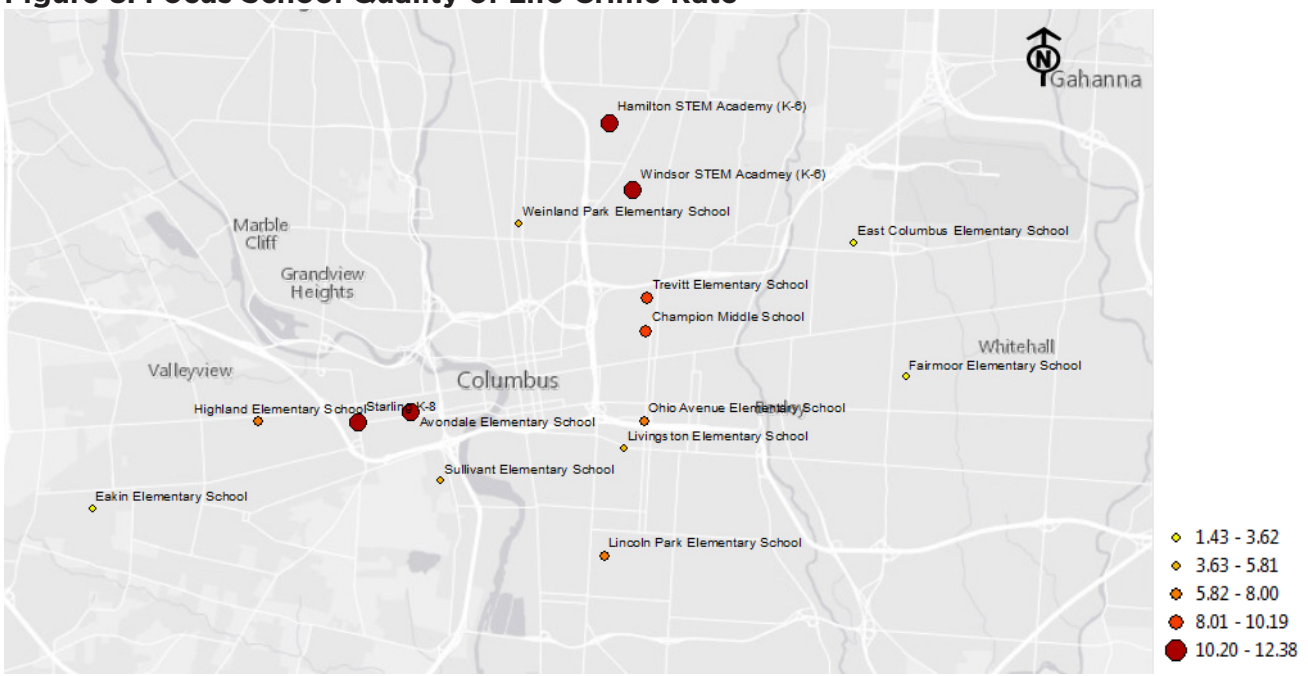
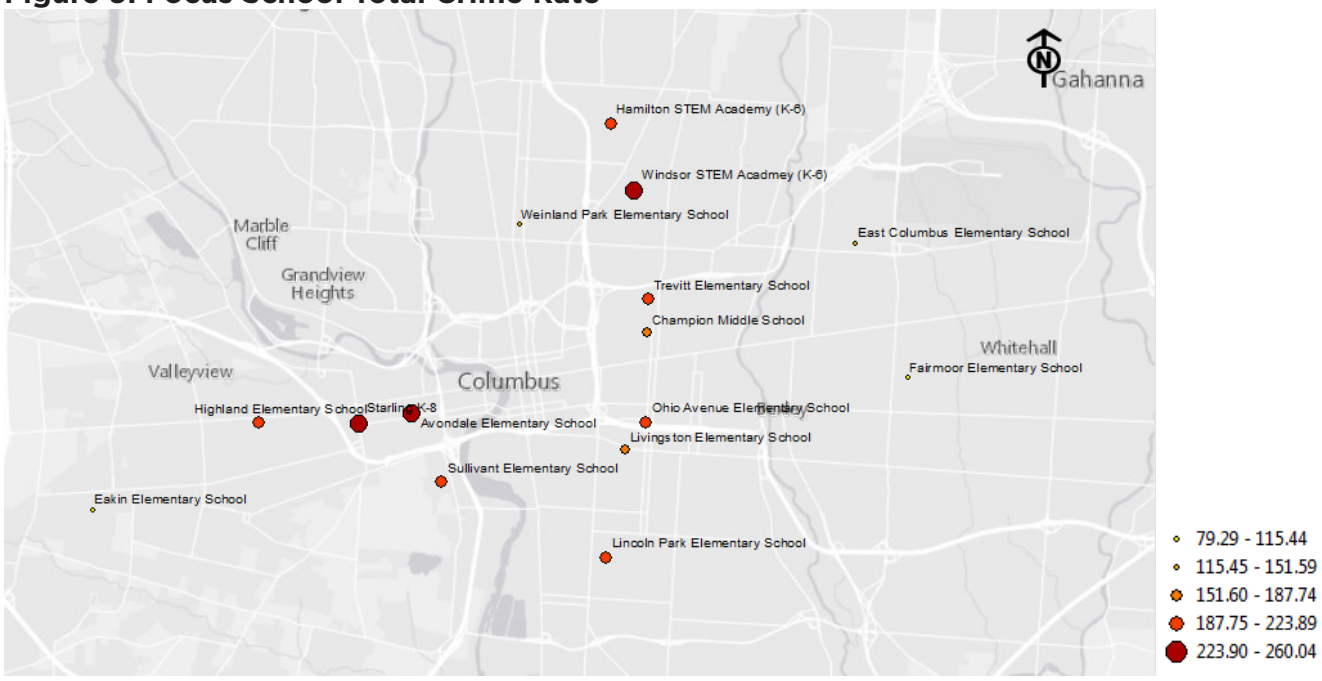


Figure 9. Focus School Total Crime Rate



Spatial analysis of the data shown below is from the entire city of Columbus. Figure 10 reveals several hot spots of violent crime that are proximate to Hamilton, Weinland Park, Avondale, Sullivant, and Eakin. Major city-wide hot spots of quality of life crimes show a weaker relationship to the Focus Schools (Figure 11).

Figure 10. Citywide Hot Spots of Violent Crime Incidents (May 2013-June2014)

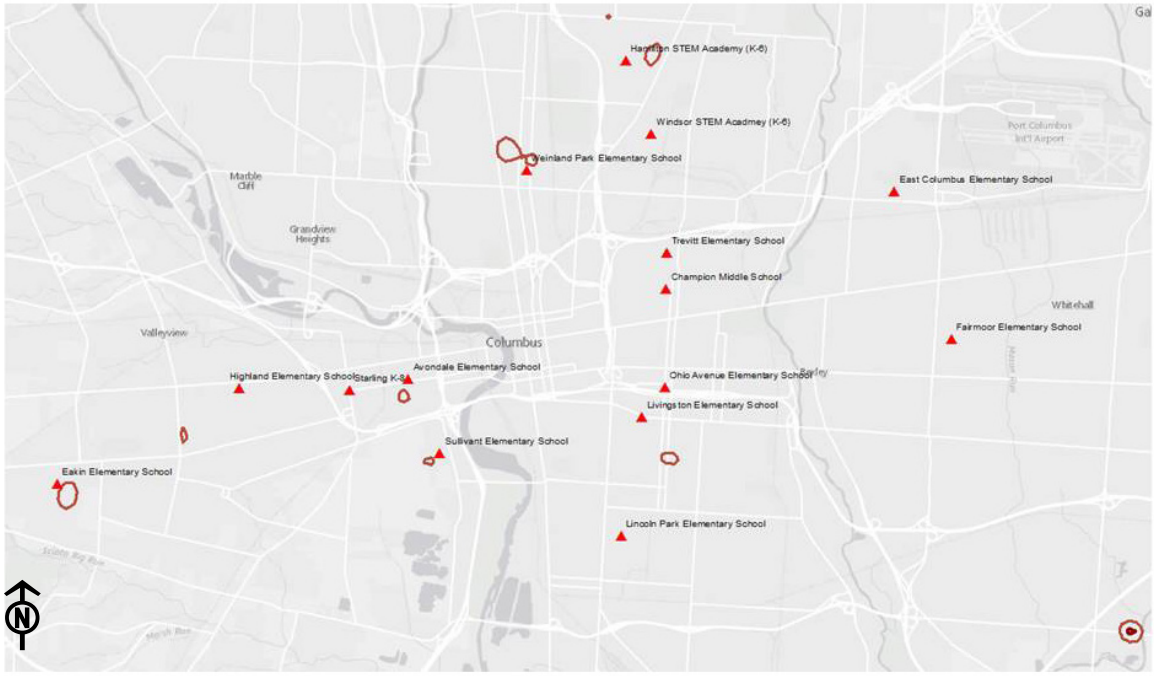
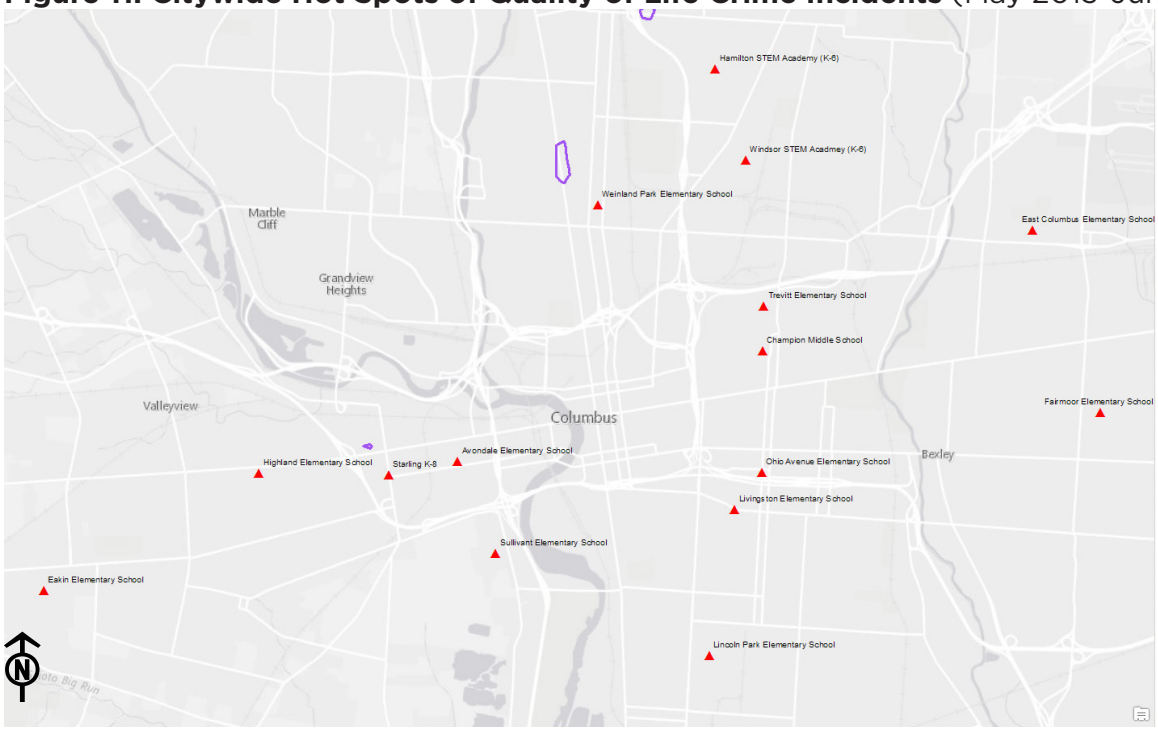


Figure 11. Citywide Hot Spots of Quality of Life Crime Incidents (May 2013-June2014)



Perception of Crime

There are a variety of data sources that can be used to measure the perception of crime and safety from crime including: the HIA perception mapping survey, the student travel tallies, the parent surveys, and the principal surveys administered as part of the SRTS LDSTP process along with data obtained from the Ohio Attorney General's Office.

PERCEPTION MAPPING

A note on the methodology of the perception mapping surveys; parental concerns were collected verbally through three survey questions, and then spatially through a sketch map component on which participants marked the locations of their concern. The instructions asked them to follow the MARK, LABLE, LIST approach where they; 1) MARK locations of concern; 2) LABLE each location with numbers 1, 2, or 3, and then; 3) LIST the reasons for their concerns at this particular location. This approach follows the methodological designed by Curtis and colleagues.[187] The surveys were administered at the 15 Focus Schools. These schools were chosen for participation based on a variety of criteria primarily based on Socio-Economic Status (SES) of the student population, with a focus on over-sampling schools with low SES students. Responses to the three survey questions were transcribed and then coded. Sketch map data was scanned as a high-resolution image, and then geo-registered in ArcGIS 10.1. The method was based on previous methods of integrating participant sketch maps in GIS. The markings were drawn as polygons which duplicate the shapes created by the participants. A fifty meter grid surface was generated for each study area, and then the digitized polygons were joined to this grid surface through a spatial join. This resulted in each grid cell containing a count of the number of polygons that intersect its boundary. This process creates a "Density of Concern" map for each

study area. Furthermore, based on the listed reasons for each concern this map can be manipulated to show areas that pose barriers to active transportation. These barriers could be related to infrastructure issues, such as sidewalk quality or availability of crosswalks, or to crime issues, such as exposure to prostitution or drug activity.

One indicator of the parental perception of crime is whether parents allow their children to walk and bike to school, or if they drive them. The majority of parents participating in the perception mapping survey drive their children to and from school (65%), which is an expected finding (Table 12). However, the disparity in the rates of driving, walking, and in the use of other modes of transportation is of interest due to the geographic variation among the schools. For example, there is a ratio of 3:1 in favor of walking at Avondale. The majority of students traveled to and from school via car at all of the other Focus Schools. However, even this ratio varied. Some schools heavily favored driving while others had a closer ratio between driving and walking.

Table 12. Primary Mode of Transporting Children to Columbus Focus Schools, Perception Mapping Survey

Mode Of Transport	Number	%
Drive	71	65
Walk	27	25
Combination	11	10
Total	109	100

The reasons parents in the Perception Mapping Survey gave for their primary mode of transportation varied from convenience as the most common response, which included issues such as distance between home and school as well as the availability of buses, to concerns about guns as the least reported reason (Table 13). Responses varied geographically among schools with some demonstrating the predominant barrier to active transportation being convenience, Avondale and Ohio, and parents at other schools, East Columbus and Livingston, reporting a nearly equal response for the barriers of convenience and safety. In this case, safety involved issues related to both traffic safety and safety from crime. In the cases of Lincoln Park and Starling, the predominant barrier to active transportation was crime. This includes the fear of their children being either exposed to crime incidences as a bystander, or being victims of crime. It should be noted that a high volume of qualitative responses to the perception mapping survey included praise for the adult crossing guards at different schools. Parents noted that the presence and personalities of crossing guards increased their sense of their child's safety.

Table 13. Reasons for Driving Children to School for Columbus Focus Schools, Perception Mapping Survey

Reasons For Driving	Number Giving this Response
Convenience	35
General Safety	18
Age of Child	11
Child Predators	9
Traffic	7
General Crime	6
Bullying	5
Crosswalk Presence / Quality	3
Weather	1
Stray Dogs	1
Vacant Houses	1
Gangs	1
Guns	1
Total	99

Parents responding to the perception mapping survey were asked to list the reasons why they would allow their child engage in active transportation to school if they were not already doing so. The most common response was that nothing could be done to allow their children to engage in active transportation to school, followed by increasing or introducing patrols (police or other), which was in turn followed by making it somehow more convenient for them and their children (distance and Walking School Buses). Though there were some differences among schools, they were negligible and not distinctly different.

Table 14. Reasons Parents Would Let Children Walk to School at Columbus Focus Schools, Perception Mapping Survey

Actions To Increase Walking	Count	%
Nothing	13	18
Patrol	11	15
Convenience	10	14
Age	7	10
General Crime	7	10
Necessity	6	8
Walking School Bus	5	7
Traffic	5	7
General Safety	4	6
Sidewalks	2	3
Weather	1	1
Unsure	1	1
Total	72	100.00

In 3 schools, there were enough people responding to the perception mapping survey to map the density of parental concerns. Results at Avondale show that parents' concerns are at their highest density in the southeast corner of the school parcel. The surveys and written

comments on the maps display the exact concerns, along with parent suggestions for intervention. This information can be linked to an exact geographical area in order to inform an understanding of problems, and the community input as to possible solutions to these problems.

Figure 12. Density of Concern, Avondale

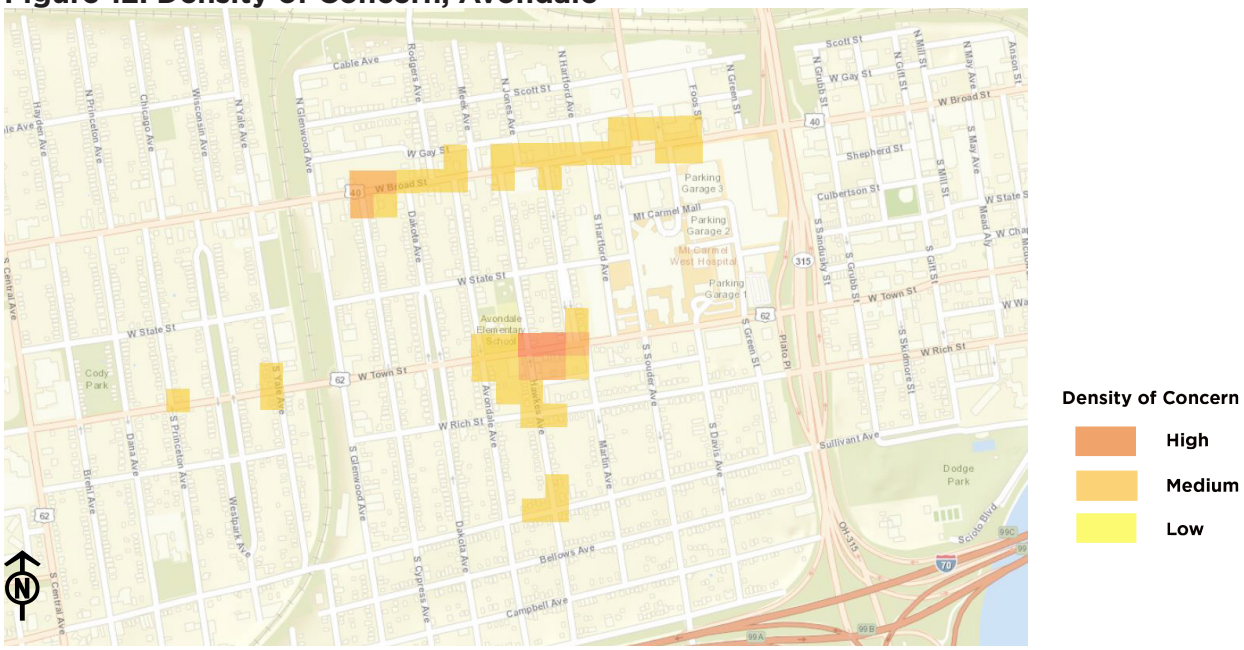
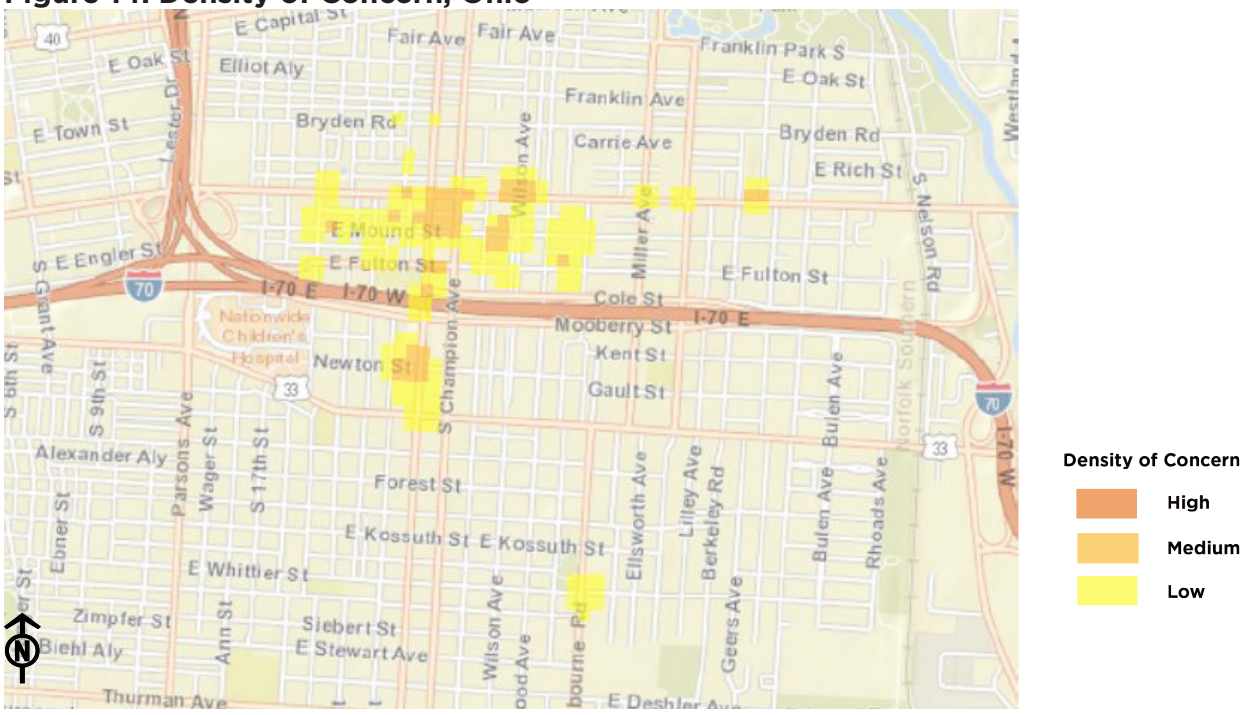


Figure 13. Density of Concern, Fairmoor

Figure 14. Density of Concern, Ohio



Student Travel Tallies

A higher percentage of youth walked to and from school while a lower percentage of youth were driven to and from school in the Focus Schools as reported in the student Travel Tallies vs. the Perception Mapping Survey respectively. Figure 15 and figure 16 show the typical mode of transportation to and from school according to the student travel tallies.

Figure 15. Typical Mode of Arrival and Departure from All Schools Travel Tally

	Number of Trips	Walk	Bike	School Bus	Family Vehicle	Carpool	Transit	Other
Morning	40784	14%	0.2%	40%	42%	3%	0.5%	1%
Afternoon	39169	17%	0.2%	43%	35%	3%	0.6%	2%

Percentages may not total 100% due to rounding.

Figure 16. Typical Mode of Arrival and Departure from Focus Schools Travel Tally

	Number of Trips	Walk	Bike	School Bus	Family Vehicle	Carpool	Transit	Other
Morning	7019	31%	0.1%	28%	38%	3%	0.4%	0.3%
Afternoon	6492	34%	0.1%	29%	32%	3%	0.6%	0.8%

Percentages may not total 100% due to rounding.

Parent Surveys

The parent surveys show that 74% of Focus School parents expressed a fear of crime and violence as being barriers to letting their children engage in active transportation to school. Violence and crime is still a barrier to CCS parents in all schools, but at a lower level, with 60% of parents reporting it as a barrier.

A qualitative analysis was performed on the 176 written comments provided on the parent surveys by only Focus School parents. The analysis found that more than 1 in 4 parents mentioned a barrier that could be overcome by a program like the Walking School Bus due to the adult supervision and guidance provided by the program. The second most common barrier mentioned was related to the fear of some type of crime with 18% of parents commenting on some type of crime. The fear of child abduction was specifically mentioned by 11% of parents. For example, one parent said, "There should be more adults out while children are walking to and from school. This is a high area for convicted child molesters." Comments like this show a misperception between the actual amount of sexual offenders and their perception of that amount, as the school where this comment was from actually has very few child molesters living within a 2 mile radius of the school. Despite this misperception, the fear of crime and abduction is real for Focus School parents.

Some illustrative comments from the Parent Survey from the Focus Schools:

- "A lot of these schools are in unsafe areas and the safety of the children isn't much of a concern to this school system."
- "I refuse to let my children walk due mostly to the crime in the area and adults who do not drive properly."
- "I don't want my baby girl walking or riding at her age. I have gotten cards for sex offenders in the mail. So I will take her back and forth to school – it's safer."
- My kids will not walk unless with an adult. There is too much criminal activity and drug dealers on the streets."

Many parents also commented about bullying, especially incidences of older children pushing younger, or smaller children into the street. This is an area of concern for schools, and impacts parents' perception of safety and willingness to let their child walk or bike to school.

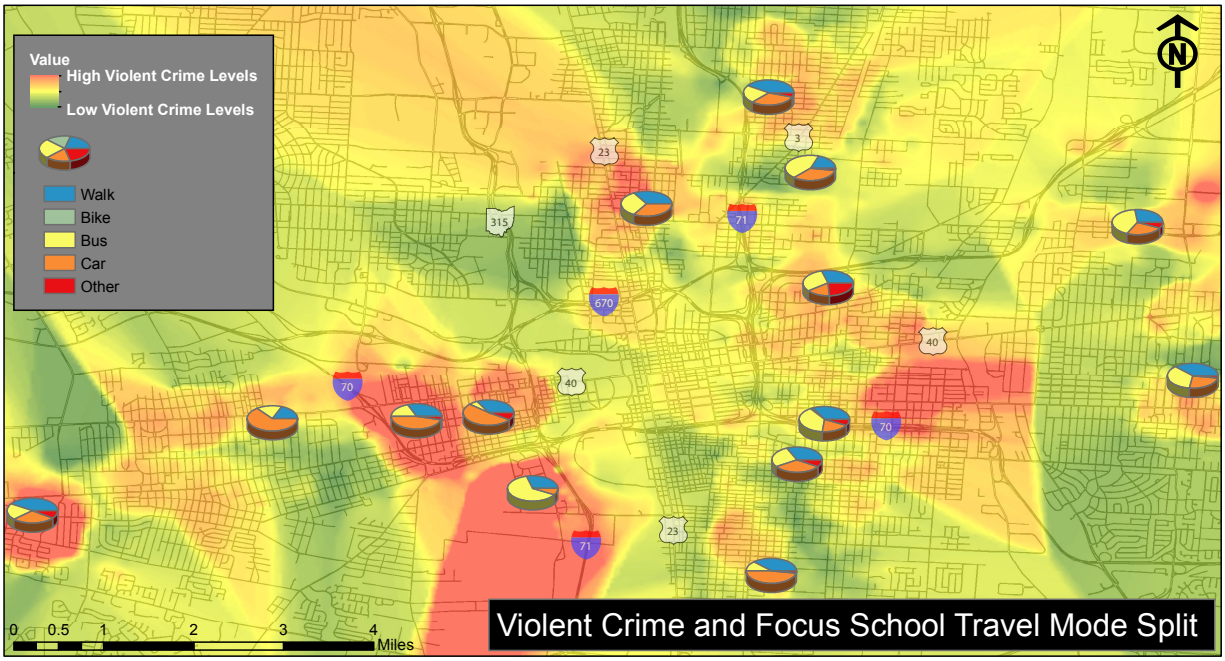
- "If not for the other children walking home, it would be fine. I have called school police to investigate since teachers say they have no control – cussing, fighting, throwing things, etc."
- "We walk because the kids on the bus misbehave and my children don't feel safe."
- "There is a lot of bullying and violence among the students and neighborhood kids on the streets."

Finally, another concern was stray or dangerous dogs along the route to school.

- "Even if we lived in the neighborhood of our school, crime, stray dogs, and a lack of safe sidewalks would still keep her from walking."

In sum, based on responses from the SRTS Parent Survey and the Perception Mapping Survey, the parental fear of crime against their children is due to; a) the perception of the presence of sex offenders in the area surrounding their route to/from school; b) exposure to drug and gang activity surrounding their route to/from school; and c) concern about the possibility of kidnapping.

Figure 17. Levels of Violent Crime and Focus School Travel Mode Split



Principal Survey

The Principal Survey data also revealed an interesting pattern. The most commonly cited barrier to students engaging in active transportation to school was a concern about violence or crime in the Focus Schools. Different responses emerged for All Schools in total, and when looking only at the Non-Focus Schools. Additionally, the Focus School principals were the only schools to cite "Lack of Adult Supervision" as one of the Top 5 barriers. See Table 15.

Table 15. Barriers to Walking and Bicycling to School - Top 5 from the Principal Survey

	Total	Focus Schools	Non-Focus Schools
Number of Responses	**48**	**9**	**39**
Barrier 1	Safety at intersections and crossings	Concern about violence or crime	Distance (i.e. Most students live too far away from school to walk or bike)
Barrier 2	Distance (i.e. Most students live too far away from school to walk or bike)	Safety at intersections and crossings	Safety at intersections and crossings
Barrier 3	Speed of traffic along key student walking and bicycling routes	Convenience (i.e. Parents find it more convenient to drive their children to and from school)	Speed of traffic along key student walking and bicycling routes
Barrier 4	Convenience (i.e. Parents find it more convenient to drive their children to and from school)	Lack of adult supervision	Convenience (i.e. Parents find it more convenient to drive their children to and from school)
Barrier 5	Volume of traffic along key student walking and bicycling routes	Distance (i.e. Most students live too far away from school to walk or bike)	Volume of traffic along key student walking and bicycling routes

Sexual Predators Part I

Parents' concerns about child sexual predators are somewhat misplaced, as noted in the literature review section of this chapter. Ohio law mandates that sex offenders cannot live within 1,000 feet of a school or day care.[188] The Ohio Attorney General Sex Offender Database shows that about 67 registered sex offenders live within a ¼ mile of the Focus Schools (or 1,320 feet) in Columbus.[189] Table 16 provides a breakdown by Focus School.

Table 16. Registered Sex Offenders Proximate to Focus Schools

School	Within 1/4 mi of a School
Avondale	5
Champion	7
Eakin	1
East Columbus	2
Fairmoor	0
Hamilton STEM	2
Highland	4
Lincoln Park	7
Livingston	2
Ohio Avenue	17
Starling	5
Sullivant	2
Trevitt	7
Weinland Park	2
Windsor STEM	4
TOTAL	67

Source: Ohio Attorney General Mike DeWine, Registered Sex Offender Database.

Programs, Staffing, and Education to Discourage Crime

The Principal Survey detailed some of the programs, staffing, and educational efforts in place to discourage crime and improve parents' sense of safety from crime.

Table 17. Programs and Staffing to Discourage Crime in the CCS Principal Survey

	Total		Focus Schools		Non-Focus Schools	
Number of Responses	**57**		**10**		**47**	
	Is implementing	**Would be interested**	**Is implementing**	**Would be interested**	**Is implementing**	**Would be interested**
Personal Security Education	11	27	1	6	10	21
Walking School Buses *	0	22	0	4	0	18
Bicycle Trains *	0	18	0	2	0	16
Observation of School Arrival and Dismissal	17	19	5	2	12	17
Number of Responses	**34**		8		**26**	
	#	**%**	**#**	**%**	**#**	**%**
Currently Use Adult Crossing Guards	28	82.4%	6	75%	22	84.6%
Currently Use Adult Safety Patrollers	–	–	3	30%	7	20.6%

**Adult supervised groups of children who regularly walk /bike to and from school together*

From Table 17, we can see that there are currently low implementation levels of the types of programs that could increase feelings of safety. Only about 1/5 of all the schools responding to the principal survey have implemented any personal security education. This proportion is even smaller at the Focus Schools. Proportionally, there is high interest in these types of programs, especially at the Focus Schools. According to the principal survey, there are currently no Walking School Buses being implemented. The staffing of adult crossing guards and safety patrollers is sufficient, with 83% of All Schools using adult crossing guards. However, 1/4 of Focus Schools do not have an adult crossing guard. The Columbus City School District Transportation Department has committed a stipend, equipment, and training for 1 adult crossing guard at every school. The Ohio Department of Transportation and the American Automobile Association of Central Ohio also provide crossing guard training and materials such as belts, flags, and rain jackets.

There have been programs in the past that could impact the perception of crime, or at least the traffic safety concerns. Consider Biking, a local biking advocacy group, has presented educational content at Valleyview, Westmoor, Dana, Starling, Avondale, Sullivant, and Lincoln. There has been some programming that included police presentations. However, these types of presentations are usually only completed once or twice in a single school, and are not tracked by the Columbus Division of Police. Also, the City of Columbus has a program called Neighborhood Pride that is implemented in at least four elementary schools in four neighborhoods, changing location each year. The program includes general and street safety, in addition to other active transportation education and encouragement activities.

Enforcement Activities
There are 2 police officers for the entire district who are stationed at various schools throughout the district. They enforce traffic speeds and observe any other illegal activities in and around schools. This effort is sustained by federal funding in coordination with the Columbus Division of Police. The police officer shift change happens at school dismissal time, meaning that the current structure of the police shift changes makes it very difficult to adequately protect students against the threat of crime. This is a very pronounced barrier to increasing the safety for students at dismissal time.

LITERATURE REVIEW AND COMMUNITY INPUT

Parental Perception of Crime and Neighborhood Environment Impacts on Children Engaging in Active Transportation to School
In 2009, the Committee on Environmental Health published a policy statement in the journal Pediatrics announcing that actions to reduce parental perception and fear of crime may promote outdoor physical activity.[190] Since this time, other researchers have corroborated that neighborhood safety impacts BMI levels, and regular physical activity.[191] [192] The relationship is actually predictive – the level of parental fear of crime being committed against their children can predict not only the level of walking and biking to and from school, but also the level of moderate to vigorous physical activity outside of school time.[193] Another study found that children are five times more likely to walk or bike to school when neighborhood safety is not a primary concern for their parents.[194]

Parental feelings of neighborhood safety on the route to school increases the likelihood that children will engage in active transportation. One study determined the odds of a child walking to school change based on a variety of things.[195] Only one of the "safety factors" had a statistically significant impact on improving rates of walking to school: if parents perceived that it was safe for the child to walk and bike in the neighborhood "most or all of the time". If they did, their child was almost two and a half times more likely to walk to school (2.42 times, see Table 18). However, several safety factors significantly decreased the chance that a child would walk: if it was always or sometimes a problem for them to find adults or other children to walk with; if violence or crime was sometimes or always a problem; and if stray or dangerous animals were sometimes a problem. These factors reduced a child's odds of walking to school by at least half. If there was never an adult or other child to walk with, the odds of them walking to school were reduced by 85%. It is interesting to note that in some studies girls' perceptions of safety are influenced by the presence of incivilities (e.g., gang tags). However, in this study basic incivilities such as abandoned houses and existence of drug paraphernalia on the route to school did not have a significant impact on the odds that a child would walk to school. [196]

Table 18. Analysis of Safety Factors and their Impact on the Odds of Walking to School

Safety Factor	Adjusted Odds Ratio of Child Walking to School	Statistically Significant? (P<.001)
Safety walking in neighborhood		
Never	Baseline	
Sometimes	1.2	
Most or all the time	1.4	
Safety riding a bike		
Never	Baseline	
Sometimes	0.9	
Most or all the time	0.98	
Safe for child to walk/bike in neighborhood		
Never/not often	Baseline	
Sometimes	1.6	
Most or all the time	**2.4**	**YES**
Afraid when alone after dark		
Disagree	Baseline	
Unsure	0.8	
Agree	1.03	
Adults or other children to walk/bike with		
Not a problem	Baseline	
Sometimes a problem	**0.5**	**YES**
Always a problem	**0.16**	**YES**
Violence or crime a problem		
Not a problem	Baseline	
Sometimes a problem	**.6**	**YES**
Always a problem	**.5**	**YES**
Stray or dangerous animals a problem		
Not a problem	Baseline	
Sometimes a problem	**.4**	**YES**
Always a problem	.7	
Attractive buildings and natural things to see		
No	Baseline	
Yes, a few	1.05	
Yes, many	1.7	
Abandoned houses or vacant lots		
No	Baseline	
Yes, a few	1.03	
Yes, many	.7	
Condoms, drug related paraphernalia		
No	Baseline	
Yes, a few	.9	
Yes, many	1.6	
Well maintained homes, apartments, gardens		
No	Baseline	
Yes, a few	.9	
Yes, many	.97	

Source: Oluyomi, et al. 2014 Parental safety concerns and active school commute: correlates across multiple domains in the home-to-school journey. Int J Behav Nutr Phys Act 11(32).

Relationship of Actual Crime to Fear/Perception of Crime
One study statistically compared the perception of crime to the actual crimes reported by the police, in order to decipher if the fear of crime predicts the actual crime in an area. They found that there were much higher perceptions of murder and rape than actually occurred; and there was a slightly lower perception of domestic violence, car theft, burglary, assault, robbery and arson than actually occurred. In this study, people think that others are being murdered and raped at a much higher rate than they actually are; they also appear to think that theft, arson, and domestic violence are happening less often than they actually are.[197] Another study looking at this topic in England analyzed crime and fear of crime in three ways (scatter plot, correlation coefficient, and linear regression) in the 39 areas. They found no clear relationship between actual crime and fear of crime, no matter what analysis was used.[198]

Keep in mind that the actual crime levels and the perception of that crime can be perpetuated by youth themselves. A study found that as many as 60% of daytime crimes are committed by truant youth.[199]

Sexual Predators Part II
As noted above, parental concerns about sexual predators are somewhat misplaced. National studies have concluded two important things about sexual predators. Firstly, the rate of recidivism for sexual crime offenders is very low. The U.S. Department of Justice found that sexual offenders were the least likely class of criminals to reoffend. About 3.5% of sexual offenders reoffended with another sexual offense within three years of being released. This includes all kinds of sexual offenses, and not just those against children. The second finding is that 93% of sex offenses against children are perpetrated not by strangers, but by a family member or someone known to the victim. Interestingly, the same study found that the general public believes that a much higher percentage (42%) of sexual crimes against children are perpetrated by a stranger.[200]

While the risk of a child being molested by a sex offender is very low, understandably no parent wants to put his or her child in harm's way. The data supplied here can help SRTS decision-makers target countermeasures that educate parents about the risks of sexual predators accordingly.

ENGINEERING IMPACTS ON CRIME AND FEAR OF CRIME

We considered how infrastructure and the built environment impacts actual crime and perception of crime. Visibility, which includes lighting, density of vegetation, and isolation, has consistently been linked to perceptions of safety. In essence, people perceive the environment as safer when they feel that others can see them and they can see other people. They also perceive safety when they can clearly observe the surrounding conditions, and that they feel they have paths to escape should they feel in danger in their current location.[201] [202] [203] [204] [205] [206] [207] In addition to these design elements, the conditions (incivilities, like graffiti, and signs of physical disorder, like blighted buildings) of the built environment can influence perception of safety.[208] [209] [210] However, Oluyomi, et. al, measured the odds of a parent allowing their child to walk to school. They found that both having adults or other children present during walk times, and feeling that the area is safe all of the time,

was statistically associated with higher odds of a child walking to school. Whereas, having a high occurrence of abandoned houses or seeing drug paraphernalia in the street were not statistically associated with higher odds of walking to school.[211]

The existence of Crime Prevention Through Environmental Design (CPTED) - types of infrastructure can increase perceptions of safety from crime in an area. However, this is only a portion of what could help parents and principals feel more secure in having students engage in active transportation to school. Department of Justice literature about CPTED, while advocating for thoughtful built environment and infrastructure solutions (such as clear lines of sight, appropriate lighting, and thinking through foot traffic patterns to make crime more difficult), also acknowledges that CPTED only works if it is done from a community policing framework. The framework involves partnering with communities, partnering with other agencies outside of law enforcement, thinking through a broad array of problems (not just crime), and gathering data to analyze crime.[212] [213]

Changes to the physical environment are only part of the solution. Research finds that parents' perceptions of the environment are more important predictors of children engaging in active transportation than are the more objectively measured characteristics of these environments.[214] [215] [216] A modeling analysis in Lansing, MI measured the amount that the built environment influenced crime and the fear of crime against social and demographic factors. They found that only a few things about the built environment were statistically tied to actual crime happening. They also found that actual crime wasn't statistically tied to social or demographic factors in their model. Additionally, they discovered that about 36% of the perception of crime was related to a lack of a sense of community, 29% was related to built environment features, and the rest was unexplained. In both models, crime was unrelated to demographic factors.[217]

ENCOURAGEMENT PROGRAM IMPACTS ON CRIME AND FEAR OF CRIME

We also considered how encouragement efforts such as programs and policies impact crime and perception of crime. Some researchers propose that parental safety concerns must be addressed through such interventions as the Walking School Bus to increase the amount of children engaging in active transportation to school.[218]

One study measured a variety of different factors that might encourage or discourage parents from letting their child engage in active transportation to school. Whether the child had adults or other children to accompany them was the most influential factor. In fact, those children were almost two and a half times more likely to walk to school (2.42 times).[219] Similarly, existing research shows that simply having more "eyes on the street" increases parental feelings of safety, and therefore permission to let their children engage in active transportation.[220] Programming such as Walking School Busses or other encouragement efforts could accomplish this.

Some researchers propose that to increase walking and biking in children parental safety concerns must be addressed through such interventions as the walking school bus.[221]

A Walking School Bus intervention went from 8-10 student participants in 2012 to more than 130 student participants in 2013. This took place in a low-income community with

the majority of the population being people of color. The increase in the number of participants signified that people felt safe enough to allow their children to engage in active transportation to school after the Walking School Bus was implemented. This community had a population that was 86% Hispanic, English was a second language for 44%, the median family income was $19,000, and 45% of families lived below poverty line. This community also had the highest violent crime rate in the city, and still they saw these successes.[222]

A resource guide for increasing safety, and the feelings of safety, while implementing SRTS in low-income communities gave examples of effective encouragement programming efforts. The Walking School Bus was the first program listed. However, creative ideas such as the Safe Passages Program, a Corner Captain Program, and community cleanups were also listed. Incentive programs such as getting hole punches each time they walk to school and green bucks to use in participating stores were also successful.[223]

EDUCATION IMPACTS ON CRIME AND FEAR OF CRIME

Evidence supporting the effectiveness of direct police-to-school student and parental education about the true risk of crime is sparse. Evidence about including public education about crime as part of school curriculum is sparse as well. Public education efforts to inform communities of actual crime rates and hot spots by soliciting information from residents about areas of concern, and in return providing feedback to residents about the successes of policing efforts, can be effective in reducing fear of crime. This is part and parcel of a model of policing called “community policing”, and is a best practice for police departments across the country.[224]

Several fear of crime guides note that mass media has been statistically shown to increase the fear of crime. Here “media” refers to both televised crime shows and the tendency for the news media to hyperbolize and increase fear.[225] [226] It is beyond the scope of SRTS to school to impact media messages about crime. However, this factor should be taken into consideration when seeking to address resident’s perceptions of crime.

ENFORCEMENT IMPACTS ON CRIME AND FEAR OF CRIME

Enforcement efforts can be extremely helpful to reduce crime and improve perceptions of crime. Enforcement efforts typically include law enforcement activities and school staffing such as school crossing guards. As noted above, parents and principals rate safety from crime as a major concern when considering allowing students to engage in active transportation to school. Funding these types of activities would greatly help to build the capacity needed to implement these efforts.

According to the National Research Council and other academics; increased police visibility, community policing, problem-oriented policing, and hot spot policing on foot have a modest but positive impact on reducing fear of crime.[227] [228] Additionally, an academic literature review of police effectiveness concluded that geographically focused policing is most effective in reducing crime, disorder and the fear of crime.[229] In particular, police foot patrols show significant effectiveness.[230]

Having adult crossing guards at almost all of the Focus Schools is an exemplary practice. From the responses to our Perception Mapping Survey conversations we can decipher that the crossing guards are a vital to increasing feelings of safety in and around schools. Supporting this, studies found that adult supervision is a frequent factor in the decision to allow children to engage in active transportation to school.[231] Adult supervision aids in allaying concerns about child abduction.[232] Research shows that crossing guards play a supportive role for children in dealing with issues like bullies.[233] However, it is clear from survey results that there are still concerns, despite having crossing guards present at most schools.

A review of efforts to increase safety at low-income schools implementing SRTS included a few examples of enforcement activities. In Flagstaff, AZ the city created a police substation that was donated office space. They also implemented a "Pull the 40's" campaign, where businesses voluntarily stop selling 40 ounce beer. The Chicago Alternative Policing Strategy staff trained Parent Patrollers & Walking School Bus leaders in Chicago, IL. Patrollers received reflective vests and walkie talkies, which helped them both gain legitimacy and easy access to police assistance. Also, Parent Patrollers were empowered to write infraction tickets if necessary to discourage poor behavior during school arrival and dismissal times. This aided in decreasing bullying and general student loitering.[234]

PREDICTIONS

How will SRTS interventions impact crime and perception of safety in our target populations?

ENGINEERING

PREDICTIONS	EVIDENCE	RECOMMENDATIONS
Incorporating CPTED design features in infrastructure improvements and in city redevelopment efforts would decrease crime and improve perception of crime.	**I)** There are numerous studies that show that Crime Prevention Through Environmental Design (CPTED) measures increase people's feelings of safety (lighting, density of vegetation, lines of sight). However, best practices include combining CPTED infrastructure with community policing.	**1.** City of Columbus Planning and Redevelopment Departments should require engineering firms to incorporate design elements that encourage clear lines of sight, single entrances, lighting, and other CPTED features in new or redeveloped projects. **2.** SRTS Engineering improvements should incorporate landscaping and lighting that follows CPTED guidelines.
Spatially targeting the removal of incivilities within a walkable distance around schools would improve girls perceptions of safety related to crime along the route to/from school.	**I)** Some studies show that reducing incivilities like gang tags and boarded up homes help to reduce fear of crime, and some studies show the reduction to be moderate. One study in particular showed that removing incivilities improves girls' perceptions of safety.	**1.** City of Columbus Public Utilities should prioritize graffiti removal and blight abatement in the Focus School neighborhoods.

ENCOURAGEMENT

PREDICTIONS	EVIDENCE	RECOMMENDATIONS
Increasing sense of safety and decreasing parental fear of crime would increase children's active transport and moderate to vigorous physical activity.	**I)** The Committee on Environmental Health states that reducing parental fear of crime can promote outdoor physical activity. Level of parental fear can predict rates of children's walking and biking to school, and moderate to vigorous physical activity.	**1.** Implement programming interventions that provide more visible adult supervision (e.g., on bike trains or walking school buses, Safe Porches, Corner Captains).
Improving sense of community in Focus School neighborhoods would decrease perception of crime.	**I)** Sense of community is actually a more powerful factor to reducing fear of crime than infrastructure.	**2.** Engaging neighborhood groups and parents in active participation in WSBs, Corner Captain programs, Safe Haven programs and the like will improve sense of community.

EDUCATION

Increasing sense of safety and parental fear of crime would lead to more parents allowing their children to walk or bike to school.	**I)** General safety, child predators, general crime, and bullying were some of the reasons parents gave for not allowing their child to walk or bike to school. At the Focus Schools, 74% of parents expressed fear of crime and violence as a barrier to letting children walk and bike to school.	**1.** Columbus Public Health, in partnership with CCS, should educate parents on the real risks in their neighborhoods to alleviate the perception of fear and how to teach their children personal safety techniques to counteract threats.

ENFORCEMENT

Increasing police presence and adult supervision would increase parents' and principals' sense of safety for students who want to walk and bike to school.	**I)** According to the National Research Council and other academics, increased police visibility, and specifically community policing, problem-oriented policing, and hot spot policing on foot, has a modest but positive impact on reducing fear of crime. **II)** All the evidence from the Parent Surveys and Perception Mapping that parents want adult supervision. **III)** Parents in the Perception Mapping Survey mentioned that crossing guards had a positive effect on fear of crime and keeping other kid sin line.	**1.** Partner with block watches to monitor crime activity and provide visual observation during arrival and dismissal times. **2.** The SRTS coordinator and CCS should work with Pride Center leaders to recruit community members to participate in a Corner Captain and/or Safe Porches program. CCS should do outreach to parents to let them know that these efforts are happening. **3.** Columbus Police Department should consider a staggered shift change to allow for more police officer presence at Focus Schools during dismissal time, especially at Weinland Park, Eakin, Hamilton STEM, Avondale, Sullivant, Livingston and Lincoln Park. Ideally there would be one police officer patrolling two schools (so a total of 7 police officers) from 2:30 – 5 PM. **4.** Make sure all Focus Schools have a paid crossing guard.

SUMMARY OF RECOMMENDATIONS

(For more detail on recommendations, see the Predictions and Recommendations Tables in each chapter)

It is our hope that the predictions and recommendations provided by the HIA will properly inform the SRTS Steering Committee about the potential effects of the countermeasures created by the Travel Plan. The HIA also provides recommendations on some of the countermeasures that should be given careful consideration due to their potential to create measurable and long-lasting change in the levels of physical activity, traffic safety, and crime. The following recommendations are what we think the LDSTP should prioritize when creating both infrastructure and non-infrastructure countermeasures. They are listed in order of the priority we assigned to them.

From reviewing the comments from the Parent Surveys completed in the Focus Schools we feel that an activated and sustainable Walking School Bus program has the potential to overcome many of the top barriers listed by parents such as; the need for adult supervision; fear of abduction and molestation; dangerous intersection crossings; the age of the student being too young to walk alone; and the fear of fighting or mugging. In fact, when looking at the parent comments we found that 26% of the barriers listed could be addressed by an active Walking School Bus program. The Walking School Bus could also address some of the violence and crime issues which were listed as barriers for 74% of parents that currently don't allow their children to use active transportation to school. In addition, the Walking School Bus could also alleviate the barrier of safety at intersections which was listed as a barrier to 54% of parents that currently don't allow their children to use active transportation to school.

From our research we also discovered that proper education about the benefits of active transportation and how to engage safely in active transportation to school can have a multitude of positive impacts. However, the needs and learning levels of parents should also be given thoughtful consideration when implementing education programming. Parents are the ultimate decision makers in their child's mode of transportation to school, and need to be included in their child's active transportation education.

Regarding the infrastructure countermeasures, we think that a complete streets policy, with the power to influence all roadway construction and repaving projects, will greatly aid in the assurance that active transportation is given priority where applicable. We also believe that pedestrians should be prioritized on every segment of every street, as they are the most vulnerable to serious injury. Also, walking is the mode that is most accessible to the widest range of the population. Specifically, any missing sidewalk segments should be replaced with new sidewalks, and street crossings should be made safer with infrastructure countermeasures implemented along the Priority Corridors. Any bicycling facilities that are striped or built along the Priority Corridors should connect to the existing or planned bicycle infrastructure in order to ensure connectivity, and alleviate gaps in the bicycling network.

In regards to enforcement, we believe that the enforcement of speed limits both in school zones and on the streets that make up the Priority Corridors is of the utmost importance, as it would address the concerns of 55% of CCS Focus School parents. This could be done with a uniformed officer present, or by remote observation in the form of traffic cameras, speed trailers, and/or speed feedback signs. Additionally, we believe that the Columbus Division of Police should consider a staggered shift change so that officers can be present during school dismissal times. This could overcome the barrier of violence and crime that was listed by 74% of CCS Focus School parents. This barrier could also be alleviated by the organization of block watches to monitor street activity during arrival and dismissal times.

The Top Ten Recommendations from All Sections of the HIA Combined are as Follows (in order of most to least priority):

1. Create and maintain a Walking School Bus encouragement program. Hire a paid Walking School Bus Coordinator to maintain an active volunteer base to lead the Walking School Busses.
2. Develop and administer active transportation education to students at all 15 Focus Schools that involves parents, and other best practices. These educational sessions should be cognizant of the schedules and restrictions of hourly, unsalaried workers and single parents in the focus school neighborhoods. These sessions also should take the learning level, language, and cultural needs of parents into consideration when developing materials.
3. We recommend that the City of Columbus adopt a complete streets policy which will capture many of the countermeasures outlined by engineering section the travel plan. This includes prioritizing the implementation of infrastructure and community engagement in the neighborhoods surrounding the Focus Schools.
4. Increase police patrols around the Focus Schools at dismissal time. The enforcement of 20 mph school zone speeds should also be increased. The Columbus Division of Police should consider a staggered shift change to allow for more police officer presence at Focus Schools during dismissal time.
5. Implement traffic calming infrastructure such as chicanes, bulb outs, pedestrian islands, landscaped medians, hi-visibility crosswalks, rapid flashing beacons, and street diets around schools that experience high volume and high speed traffic.
6. Build new, or improve existing sidewalks along with the installation of traffic signals as a countermeasure within ¼ mi of schools. All new infrastructure should be properly maintained.
7. Provide bicycling facilities such as separated bike lanes on arterial roadways and bicycle boulevards on local streets with traffic calming measures such as chicanes, bulb outs, and traffic circles. Ensure that any proposed infrastructure connects to the existing bicycling infrastructure to provide a safe, desirable, and low-stress network of bicycling facilities.
8. A maximum speed of 20 miles per hour should be established along major walking and biking routes during before and after school hours.
9. School should partner with neighborhood block watches to monitor crime activity and provide visual observation during arrival and dismissal times.
10. A minimum of 75% of infrastructure interventions built as part of Safe Routes to School funding should be allocated to the 15 Focus Schools identified in this report.

Here the Recommendations are Broken Down by Section. They are Listed from Most to Least Priority.

TO INCREASE PHYSICAL ACTIVITY AND REDUCE CHILDHOOD OBESITY:

Engineering

1. Build new, or improve existing sidewalks along with the installation of traffic signals as a countermeasure within ¼ mi of schools. All new infrastructure should be properly maintained.

2. Implement traffic calming infrastructure such as chicanes, bulb outs, pedestrian islands, landscaped medians, hi-visibility crosswalks, rapid flashing beacons, and street diets around schools that experience high volume and high speed traffic.

3. Ensure that both Focus Schools and Non–Focus Schools have intersections treatments where needed.

4. Provide bicycling facilities such as separated bike lanes on arterial roadways and bicycle boulevards on local streets with traffic calming measures such as chicanes, bulb outs, and traffic circles. Ensure that any proposed infrastructure connects to the existing bicycling infrastructure to provide a safe, desirable, and low-stress network of bicycling facilities.

5. Place LDSTP infrastructure countermeasures suggested along the priority corridors to connect schools to not only student residences, but also recreational facilities and healthy food options.

6. Focus on pedestrian infrastructure for schools located in higher density areas and remote drop-off locations for schools in less dense neighborhoods.

7. The City of Columbus Department of Development should encourage low-income housing redevelopment in lower income neighborhoods, while also requiring high density development in balance with single family housing.

Encouragement

1. The City of Columbus should adopt a complete streets policy that prioritizes implementing infrastructure and community engagement the neighborhoods surrounding the Focus Schools.

2. Increase funding for encouragement and education to support a full-time SRTS Coordinator. Increased funding could be from ODOT; other SRTS Steering Committee member organizations could co-fund the position; or the SRTS Steering Committee could work together to find grant sources.

3. Create and maintain a Walking School Bus program with a paid coordinator whose job description includes emphasis on organizing in Focus Schools and maintaining an active volunteer base.

4. SRTS Coordinator should create and carry out an encouragement plan with innovative encouragement efforts that meet the unique needs of the Columbus City School student population.

5. The SRTS Coordinator should work closely with the Bicycle/Pedestrian Coordinator for the City of Columbus in order to connect and coordinate SRTS efforts with those made in the greater community. If there is not a Bicycle/Pedestrian Coordinator for the City of Columbus that position should be created.

TO IMPROVE TRAFFIC SAFETY:

Engineering

1. Place multiple Safe Routes to School engineering interventions around each of the Focus Schools in close proximity to each other, and along the Priority Corridors.
2. Traffic calming measures that result in decreased vehicle speed should be prioritized around Focus Schools.
3. Infrastructure improvements should specifically address the main traffic issues of each school, with significant input from parents, principals, and support staff.
4. A maximum speed of 20 miles per hour should be established and enforced along major walking and biking routes during student arrival and dismissal. Enforcement should include infrastructure interventions such as flashing beacons, and law enforcement speed checks.
5. Engineering interventions should be placed along priority corridors that link affordable housing developments to Focus Schools.
6. A minimum of 75% of infrastructure interventions built as part of Safe Routes to School funding should be allocated to the 15 Focus Schools identified in this report.
7. Engineering interventions should be prioritized around Focus Schools with a significant population of Latino students, primarily on routes frequented by these children.
8. The Columbus City School district should consider reestablishing the boundaries of school attendance zones so that students cross as few major roads as possible when engaging in active transportation.
9. Affordable housing developments that are located on high-speed, high-volume roadways should be required to provide pedestrian and bicycle access away from those roadways.

Encouragement and Education

1. Develop encouragement programs targeted at U.S. born families that highlight the benefits of active transportation and how to do so safely.
2. Develop and administer pedestrian education to students at all 15 Focus Schools that involves parents. These educational sessions must consider the schedules and restrictions of hourly, unsalaried workers in the Focus School neighborhoods; the learning levels of parents in these communities; the language and cultural needs of the Latino and other non-English speaking communities; and should also be specifically targeted toward middle school students.

Enforcement

1. Increase police patrols at the Focus Schools during school dismissal.
2. Increase the enforcement of 20 mph school speed zones with both police checks and infrastructure (such as flashing beacons, etc).

TO REDUCE CRIME AND FEAR OF CRIME:

Engineering
1. The City of Columbus Department of Development should require engineering firms to incorporate design elements that encourage clear lines of sight, single entrances, lighting, and other CPTED features in new or redeveloped projects.
2. SRTS engineering improvements should incorporate landscaping and lighting that follows CPTED guidelines.
3. The City of Columbus Department of Public Utilities should prioritize graffiti removal and blight abatement in the Focus School neighborhoods.

Encouragement and Education
1. Implement programming interventions that provide more visible adult supervision (e.g., Bike Trains or Walking School Buses, Safe Porches, Corner Captains).
2. The SRTS Coordinator should engage neighborhood groups and parents to actively participate in Walking School Buses, Corner Captain programs, and Safe Haven programs to improve the sense of community and crime safety.
3. Columbus Public Health, in partnership with CCS, should educate parents on the real crime risks in their neighborhoods to alleviate the perception and fear of crime along with facilitating partnerships that can teach children personal safety techniques to counteract threats.

Enforcement
1. The SRTS Coordinator and the Columbus Division of Police should partner with block watches to monitor crime activity and provide visual observation during arrival and dismissal times.
2. The SRTS Coordinator and CCS should work with Pride Center leaders to recruit community members to participate in a Corner Captain and/or Safe Porches program. CCS should perform outreach to parents to let them know that these efforts are happening.
3. The Columbus Division of Police should consider a staggered shift change to allow for a higher degree of police officer presence at the Focus Schools during dismissal time, especially at Weinland Park, Eakin, Hamilton STEM, Avondale, Sullivant, Livingston, and Lincoln Park. Ideally there would be one police officer patrolling two schools (so a total of 7 police officers) from 2:30 – 5:00 PM.
4. Encourage all Focus Schools to employ a paid crossing guard.

LIMITATIONS

While the HIA provided added value to the LDSTP, there were some limitations encountered during the research and engagement aspects of the HIA.

One of the first limitations was a scarcity of neighborhood level data. We overcame this limitation by expanding our data gathering to a broader population level by looking at census tracts and zip codes. Also the CCS BMI data is only available externally at the district level, making comparisons between Focus and Non-Focus Schools impossible.

During the literature review we found that research regarding the impact of active transportation to school on overweight and obesity needs to be expanded. This would include studying a more diverse set of populations, and better quantifying the relationship between physical activity, more specifically active transportation, and the BMI rates over extended periods of time. We also found a lack of research on the effects of enforcement on the areas of physical activity and traffic safety.

Other challenges that were specific to this HIA were the staff time dedicated to the project was split between the HIA and other duties. A full-time HIA Coordinator would have allowed more staff time to dedicate to the HIA in order to move it along at a faster rate.

During the engagement period we encountered difficulties in getting residents to participate in the walk assessments due to the times that they were held. They took place during school arrival and dismissal times, which are during regular day shift work hours, and not convenient for most residents. We had some turnout, but we could have had more to get a better sample size. Interviewing parents and guardians was a challenge as well. They were also in a hurry to get to work in the mornings, while also not commonly available for engagement in the afternoon. We mainly relied on interviewing the captive audience of parents waiting in their cars to pick up their students. This effectively skewed the data in favor of parents who drive their children to school.

When gathering data from the schools in the form of the Parent Surveys and the student Travel Tallies it took some time to get the proper permission to interact with the schools from the upper administration at CCS. With a school district this large, it is a cumbersome process to get the proper permissions through the approved channels. The autonomy of the schools also presented issues after we had the permission to interact with the school principals. Some of the school principals were very cooperative and easy to communicate with, and some were not. The level of autonomy of the schools also meant that each school had different community partners, so being able to track those partnerships and communicate with them was also a challenge.

Since we started at the top level school administration, which was necessary and beneficial in order to get the proper approval, it was challenging and time consuming to get down to the non-administration level (the wellness champions, the parent consultants, teachers, and other staff) to fully engage with both the staff and the parents at the schools.

Finally, when we reached out through our contact with the police to obtain local crime datasets we had to talk to a second source in order to get the data set that we needed. However, once we did meet with the second source we were able to obtain any data that we needed in a very cooperative and helpful manner. We thank the Columbus Division of Police for their time and cooperation.

MONITORING PLAN

In an on-going effort to ensure that the positive health and equity impacts that have been predicted by the HIA are being driven and supported by the SRTS LDSTP, a monitoring plan has been created as the final step of the HIA. The agencies that are responsible for monitoring the outcomes by tracking these indicators will be charged with revising the countermeasures recommended by the LDSTP to ensure that the plan is actively creating positive health and social equity impacts in the areas of Engineering, Encouragement, Education, and Enforcement.

Indicator	Who is Responsible for Measuring it?	Data Collection Tool	How Often Should This Be Measured?
Did infrastructure get built as they decided?	Columbus SRTS Coordinator & Public Service	Public Service roadway construction project fact sheets	Annually
Did Focus Schools get priority for SRTS funding?	SRTS Coordinator & Steering Committee	ODOT SRTS budget and application requirements	Annually
Rates of walking/biking to school	SRTS Coordinator & Steering Committee	Parent Survey, Student Travel Tally	Annually
Bike/Ped crash rates with 1/2 mi of focus schools; Injury/fatality rates from crashes, disaggregated by school neighborhood	ODOT	Highway Safety Safe Routes to School Crash Statistics	Every 3 years
# of active Walking School Busses in Focus Schools	SRTS Coordinator & Steering Committee	Principal Survey	Annually
Increased police presence	SRTS Coordinator/ Columbus Division of Police	Interview with Police and parents and/or community organizations	Annually
Sense of community	Neighborhood Pride	?????	Annually
BMI, disaggregated by school	CCS Wellness Initiative	CCS BMI Data	Annually

Ideally one entity, SRTS Steering Committee, would be responsible for gathering all of this data in one place. That entity would publicly disseminate how the SRTS LDSTP implementation is progressing health equity in the Columbus City School District through various channels. An annual report should be created, disseminated to the schools, and posted on the Columbus Public Health website.

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